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A GUIDE FOR PLANT COLLECTORS TO SPECIALIZED
SUBSTRATE TERMS OF USE IN LATIN AMERICA:
SUBSTRATES OF ANIMAL ORIGIN

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Elaborate vocabularies for subjects of supposedly limited amplitude are well known to anthropologists, linguists, botanists and computer engineers, among others. The more than 20 words for snow in the languages of the Eskimo tribes (Whorf, 1940) and the 490 terms for various kinds of plant trichomes and indumenta (Payne, 1978) are merely two examples, among many, that come to mind.

Through the diverse regions of Latin America a relatively rich terminology has evolved to refer to substrates of animal origin, be they excrement, bones, regurgitated stomach contents or carcasses. Dung, particularly that of domestic herd animals, has long been of interest to anthropologists and students of human ecology intent on analyzing the energy equations of rural or pre-industrial cultures (Winterhalder, Larsen & Thomas, 1974). The use of dung among such peoples as a fertilizer, fuel or insect repellent (when dried and burned) is well documented in the anthropological literature.

Little formal attention has been paid to the terminology of use in Latin America that refers to substrates of animal origin, yet the subject cannot fail to hold interest for botanists who study coprophilous floras and who inevitably encounter the subject, either in the field, when talking to local inhabitants, or on herbarium labels where such terms appear. While many of the terms are of wide currency and can be found in any reasonably complete dictionary, others are of restricted use, limited to certain regions, or are orthographic or phonic variants of French (Creole), Portuguese or Spanish words and normally do not figure even in unabridged dictionaries. Unfamiliar words for such substrates are the source of some confusion when taken from field notes, or other original sources, and translated into English onto specimen labels. The author has come across several

examples of such substrate terms being misinterpreted as the name of some other kind of substrate or as the name of a nearby village or other landmark.

In order to ameliorate this situation and provide a working list of terms for students of neotropical coprophilous floras, the following abridged glossary is offered. These terms were compiled from the author's own notes made over a period of 25 years while engaged in field work in Latin America and from information solicited from colleagues living in or knowledgeable about Latin America and whose collaboration is recognized elsewhere in this paper.

The glossary makes no pretensions to completeness nor to the degree of accuracy which philologists would require. Each term is identified by gender, masculine (m) or feminine (f), and language, Creole (C), Portuguese (P) or Spanish (S). Notes are provided which give some notion of the regionality of each entry and, in some cases, additional meanings associated with a particular term.

Abono (m, S). General term for fertilizer. Note that in Portuguese this term means a bonus or warrant.

Bolitas (f, S). Excrement of somewhat spherical shape, as that of rabbits, sheep or goats. Chile.

Boñiga (f, S). Excrement, especially that of cattle, but used locally to refer to that of any large animal. Of general use. Not common.

Boñigo (m, S). Orthographic variant of boñiga.

Bosta (f, P, S). Excrement of domestic animals, especially of large herd animals or, occasionally, of wild species. Common term, particularly in Northern South America.

Boyo (m, S). Excrement of humans. Chile.

Buñiga (f, S). Orthographic variant of boñiga. This is the form encountered in Central Mexico, often used in reference to the dried dung of cattle.

Caca (f, C, P, S). General term for the excrement of mammals, including that of humans. Common term throughout Latin America.

Cacarrutas (f, S). Excrement of small size, as that of mice, rats or insects. Of general use throughout Latin America.

Cagajón (m, S). Excrement of large size, as that of mules, horses or cows. Common in Northern Latin America.

Cirre (m, S). Excrement of goats. Extremely local in occurrence. Apparently limited to Northeastern Mexico and likely represents a phonic variant of the Spanish word sirle, meaning the excrement of sheep and goats.

Cocô (m, P). Used colloquially in Brazil to refer to animal excrement, but also meaning (in Portuguese and Spanish) the fruit of any of a number of Arecaceae.

Esterco (m, P). General term for excrement in Brazil.

Estiercol (m S). General term for excrement in Spanish-speaking countries.

Estrume (m, P). Excrement of oxen, cows, horses or any other large animal. Brazil.

Fezes (f, P). Used in the plural form, meaning feces or excrement. Brazil. Carries offensive implication in particular contexts.

Guano (m, P, S). Excrement of avian or mammalian origin, but mostly reserved for accumulations of excrement that result from high concentrations of animals, whether living in natural bands or rookeries or in artificial enclosures.

Heces (f, S). Plural form of hez, and, when used in the plural, referring to excrement in general. Used colloquially in derogatory contexts.

Huano (m, S). Orthographic variant of guano.

Merda (f, P). Offensive term for excrement. Brazil.

Mierda (f, S). Offensive term for excrement in most Spanish-speaking countries; however, accepted in polite conversation in certain areas (e.g., Loreto, Peru).

Meca (f, S). Excrement in general, but particularly that of birds, cats, dogs or humans. Chile.

Pecueca (f, S). Excrement in general. Limited to Andean Colombia, particularly to Cundinamarca.

Pepas (f, S). Excrement of the guinea pig (Cavia spp.). Limited to Andean Colombia. More widespread meaning is as variant of pepita, the seed of any of a variety of fruits, including squashes, apples, pears, etc.

Píldoras (f, S). Excrement of rabbits, goats or other species producing small droppings. Costa Rica. More general meaning is pills.

Plasta (f, S). Excrement that is fresh or semi-liquid. That which is voided in a single mass. Costa Rica, Chile.

Polvarón (m, S). Excrement of horses or mules. Costa Rica.

Popó (m, S). Colloquial term for human excrement. Mexico.

Raja (f, S). Colloquial term for excrement in Central Mexico. More widespread meaning is that of slices of a variety of objects from firewood to fruits, roots, stems, fish or meats.

Títica (f, P). Excrement of birds in general. Brazil.

Tolheadeira (f, P). Excrement of birds of prey. Also refers to vomited mass of fur, bones or teeth. Brazil.

Vidrio inglés (m, S). Animal excrement. Costa Rica. Also used colloquially in that country in humorous contexts.

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NOTES ON THE CYCLANTHACEAE OF SOUTHERN CENTRAL AMERICA INCLUDING THREE NEW SPECIES

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Although often abundant in tropical primary forest, the Cyclanthaceae have been poorly known for two major reasons: they are most diverse in some of the least explored habitats, namely the wettest areas, and the plants are difficult to collect and thus often ignored by collectors. The following notes and new species, resulting from over two years of field work at La Selva field station in northeastern Costa Rica and four field trips specifically to study Cyclanthaceae in various parts of Costa Rica and Panama, are presented here to provide names for new species in the Flora of La Selva (Hammel, 1986).

NOTES

When Harling (1958) monographed this family he treated a total of 180 species in eleven genera. At that time 37 species in eight genera were known from Central America. Recent collecting, especially in Costa Rica and Panama indicates that there are probably twice that many species in the region. All of these will be treated in the Cyclanthaceae for Flora Mesoamericana, which I am preparing. No additional genera have been found since Harling's monograph, but 29 new species have been described (Schultes, 1959; Harling, 1963, 1972, 1973; Wilder, 1978; Grayum & Hammel, 1982; Galeano & Bernal, 1984), four of them from Central America.

It is not yet clear whether the increase in numbers of species known from Central America will be due more to newly discovered endemic species or to range extensions from South America. In many cases this question can only be answered by revisionary work with a strong field orientation; nearly half of the species in Harling's monograph were known only from the type collection. Nevertheless, range extensions for several distinctive species can now be indicated.

Range Extensions

Although Cyclanthus is usually treated as a monotypic genus, the first new species in the family to be described after 1958 was C. indivisus Schultes (1959). This species was described from the Amazonas commissary

of Colombia and is distinguished by its smaller habit and undivided mature leaves. Plants of this species are now known from certain areas of primary forest in Colon and Panama provinces and in the Comarca of San Blas just north and east of Panama City. Ludovia lancifolia Brogn., which Harling recorded only tentatively from Central America, is now definitely known from these same areas in Panama. Also, Ludovia integrifolia (Woods.) Harl., known previously in Central America only from Darien Province of Panama, has now been collected from numerous sites along the Caribbean lowlands as far north as southeastern Nicaragua. Likewise, the monotypic genus Thoracocarpus had been known in Central America only from Darien Province of Panama but is now known to extend into Bocas Del Toro Province and southern Costa Rica. Numerous species of Asplundia, Dicranopygium and Sphaeradenia, formerly known only from South America, are also now known from Central America. These will be dealt with in subsequent papers.

Key to the genera

For the most part Harling's genera are easily distinguished, and probably monophyletic, however, his monograph is not widely available. According to the floristic treatments that are still primary sources of names for plants of the region (i.e. Flora of Guatemala and Flora of Panama--both published prior to Harling's treatment) most species in Central America would be treated as members of the genus Carludovica. The following key, emphasizing vegetative characters of the eight genera from Central America, should help to correct this problem.

1. Leaf blades with 2 major lateral costae running nearly the entire length of the blade, usually deeply bifid nearly to the base; spadix a cylinder of rings formed by alternating staminate and pistillate units; plants terrestrial, usually acaulescent CYCLANTHUS
1. Leaf blades with the 2 lateral costae (if present) always disappearing well below the tip of the blade, entire to deeply divided; spadix a cylinder or sphere of tightly packed but distinct staminate and pistillate flowers; plants epiphytic, epipetric, or terrestrial, often caulescent

2. Petioles mostly 1.5 to 3 m long, terete; leaf blades palmately divided into 4 segments, the segments deeply toothed; plants terrestrial; surface of the mature spadix irregularly splitting back to reveal the bright orange seed pulp and rachis; seeds angular CARLUDOVICA
2. Petioles less than 1 m long flattened above; leaf blades usually entire or bifid, not toothed (very rarely palmately divided and deeply toothed but the plants then epiphytic); surface of mature spadix not splitting back; seeds flat or terete
3. Leaves with 2 conspicuous lateral costae about as thick as the midrib ASPLUNDIA
3. Leaves without conspicuous lateral costae
4. Spathes (or their scars) clustered immediately below the spadix
5. Plants long-stemmed and branched, usually climbing; stems and dry leaves scabrous; fruits separate to base; seeds flat, orange EVODIANTHUS
5. Plants mostly nearly stemless, unbranched, usually growing on rocks along streams, rarely with a short stem and climbing a short distance; stems and leaves not scabrous; fruits united most of their length; seeds terete, purple DICRANOPYGIUM
4. Spathes dispersed along the peduncle
6. Leaves distichous
7. Leaf blades never bifid; fruiting spadix nearly smooth, the pistillate flowers embedded in the rachis and very distant; plants lianas or nearly stemless epiphytes LUDOVIA

7. Leaf blades of mature individuals bifid; fruiting spadix not smooth; plants terrestrial or epiphytic, usually nearly stemless
..... SPHAERADENIA

6. Leaves spirally arranged

8. Petioles broadly channeled their entire length; many nearly mature-sized leaves undivided; mature fruiting spadix often 6-7 cm in diam., the fruit surface lustrous, hard, and brittle; spathes 8-11; plants lianallike canopy climbers THORACOCARPUS

8. Petioles broadly channeled only at the base; mature-sized leaves always divided; mature fruiting spadix usually less than 3 cm in diameter, the fruit surface not lustrous, hard, and brittle ; spathes 2-8; plants low trunk climbers or terrestrial ASPLUNDIA

NEW SPECIES

Carludovica sulcata Hammel sp. nov. **Figure 1.** TYPE: Costa Rica, Prov. Heredia, Finca La Selva, 7 August 1983, Hammel 13330 (holotype: DUKE; isotypes: CR, F, MO).

C. drudei Masters affinis sed dentibus marginalibus laminas semper regularibus, ca. 10 cm longis; stigmatibus late sulcatis et basi staminodiorum persisteni.

Terrestrial, acaulescent plants to 2.5 m tall. Segments of the leaf blades about 75 cm long, 25 cm wide, dividing the blade to within 5 cm of the base, dark green; teeth of the blade to 10 cm long, 2-3 cm wide. Spathes 3; spadix to 12 cm long. Staminate flowers with 20-25 tepals, stamens 50-90, anthers 1.2 mm long. Stigmas more or less linear but deeply sulcate, spreading wide in fruit, mounted on the ovate or rectangular-inflated style, not uncinat.

SPECIMENS EXAMINED. *Costa Rica*, Prov. Heredia, Finca La Selva, Hammel 10960, 13108, 13246; McDougal 1029 (DUKE); *Nicaragua*, Prov. Rio San Juan, Cano Santa Crucita, Araquistain 3267 (MO).

PHENOLOGY. Flowering mid rainy season July and August, fruiting late August to early October.

DISTRIBUTION AND HABITAT. *Carludovica sulcata* is known only from the Caribbean lowlands of northeastern Costa Rica and adjacent Nicaragua. It is common in old secondary woods and occasional along streams in the primary forest at La Selva, the type locality. *Carludovica rotundifolia* Hook. f. also occurs at the type locality but is much less common and found only in a few areas on steep riverbanks.

RELATIONSHIPS. *Carludovica* is the only genus of Cyclanthaceae that is more diverse in Central America than in South America. As pointed out by Harling (1958) the ubiquity of plants in this genus (especially *C. palmata* Ruiz & Pavon, which is cultivated as a yard ornamental in many parts of the tropics) as well as their bulkiness has led to their being considered uninteresting taxonomically and ignored by collectors. One goal of my current work on *Carludovica* is to expose its diversity; at least 1 or 2 more species will need to be described from southern Central America. *Carludovica sulcata* brings to four the total number of species recognized in the genus. It is closely related to *C. drudei* Masters by virtue of its relatively long pistillate tepals and sessile stigmas. It differs primarily in its deeply sulcate stigmas--from which the specific epithet derives--and persistent staminodial bases. Both *C. drudei* and *C. palmata* appear to be polymorphic for the length of the marginal teeth of the leaves, some populations being deeply, irregularly toothed and others with relatively shallow, regular teeth. Both *C. rotundifolia* and *C. sulcata*, however, always have relatively regular and shallow marginal teeth.

***Dicranopygium umbrophila* Hammel sp. nov. Figures 2 & 3.** TYPE: Costa Rica, Prov. Heredia, Finca La Selva, 20 May 1982, Hammel 12386 (holotype: DUKE; isotype: CR).

Dicranopygium izabalensis Harl. affinis sed plantae terrestres vel raro epiphyticae, in silva nunquam ad saxos in rivulis vigens; petioli purpurei ad basim; spathae internus purpureae; pedunculi purpurei; stamina (20-35), ca. triplo numerosi quam *D. izabalensei*.

Terrestrial or sometimes climbing, caulescent plants usually about 50 cm tall. Leaf blades 30-45 (47) cm long, unicostate, bifid for 1/2 to 2/3 their length, the divisions (4) 5-7.5 (10) cm wide; petiole 30-50 cm long, purple brown, scurfy below. Peduncle 3-7 cm long at anthesis, (7) 17-19 (30) cm long in fruit, purple and covered with brownish scurf below. Spathes 2, 3.5-4.5 cm long, purplish inside. Receptacle of the staminate flowers flat; perianth lobes (4) 6-7 (9); stamens (20) 24-32 (35), anthers 0.9-1.1 (1.3) mm long, 0.5-0.6 mm wide, filaments no more than 0.1 mm long; basal bulbs large, globose. Tepals of the pistillate flowers truncate, connate at least in later stages, lower than the stigmas, 5-8 mm wide in fruit; stigmas narrowly oblong overall and sometimes slightly projecting through the tepals, ca. 3 mm long in fruit, the actual stigmatic crest linear. Fruiting spadix 3-4.5 cm long, 1- 1.5 cm thick.

SPECIMENS EXAMINED. Costa Rica, Prov. Heredia, Finca La Selva, Beach 1437; Chacon 874; Grayum 2533, 2972; Folsom 9619, 9891; McDowell 112, 1059; Hammel 8645, 9434, 12386; Wilbur 30040, 30046; Wilbur & Jacobs 34926 (all at DUKE).

PHENOLOGY. Flowering and fruiting throughout the year.

DISTRIBUTION AND HABITAT. Dicranopygium umbrophila is known for certain only from La Selva in northeastern Costa Rica. Many collections from Panama also appear to belong to this new species but will be cited later in connection with a revision of the genus for Central America. The species is sympatric at La Selva with D. wedelii Harl., which is often abundant and restricted to rocks in small streams or open banks along rivers. Unlike the great majority of species of Dicranopygium, which are stream-loving (fide Harling, 1958), D. umbrophila is quite common in the forest understory. At La Selva it is met with most frequently in swamp forest where it is often seen to climb on fallen logs or a short distance up tree trunks. Its purplish peduncles, brownish scurf, and forest habitat help distinguish D. umbrophila from other Central American species.

RELATIONSHIPS. Dicranopygium umbrophila belongs to subgenus and section Dicranopygium, the largest group in the genus. It appears to be most similar to D. izabalense. Its relationships will be discussed in more detail in a forthcoming revision of the Central American members of the genus.

Sphaeradenia pendula Hammel sp. nov. Figures 3 & 4.
TYPE: Hammel 9528 (holotype: DUKE; isotypes; CR, MO).

Sphaeradenia ensiformis (Hook.) Harl. affinis sed plantae pendulae; laminae longiores (65-95 cm) et angustissimae (1.5-2.5 cm); petioli longiores (40-70 cm); flores masculini breviores (2.5 mm) et angustiores (1.5 mm), tepalis paucioribus (4-6); fructus virides a flavidus, indehiscentes.

More or less acaulescent pendent epiphytes. Leaf blades very thick, coriaceous, divided nearly to the base, the divisions 65-95 cm long, 1.5-2.5 cm wide; petiole 40-70 cm long. Spathes 3-4, the lowermost one to 14 cm long, 1 cm wide, acuminate. Flowering spadix 3 cm long, 1 cm thick, in fruit to 8 cm long, 2.5 cm thick, green. Staminate flowers asymmetrical, 2.5 mm long, 1.6 mm wide, stamens 20-25; anthers 0.6-1.0 mm long, 0.4 mm wide, provided with a small secretion globule; basal bulbs same diameter as the anthers. Pistillate flowers separate to the base; tepals connate at base in fruit; style about the same height as the tepals; ovary distinctly protruding from the spadix at maturity, the separate fruits indehiscent. Seeds elliptic, funiculus end blunt and mucilaginous, chalazal end with an acuminate appendage.

SPECIMENS EXAMINED. Costa Rica. Heredia: Finca La Selva, Folsom 9552; Grayum 1957; Hammel 9528, 10737, 11514; McDowell 1055; D. Smith 399, 590 (all DUKE). Panama. Bocas Del Toro: Hammel 13708.

PHENOLOGY. Flowering from August probably through December, fruits maturing January through April.

DISTRIBUTION AND HABITAT. This species is known from primary forest in the Caribbean lowlands of northeastern Costa Rica to wet hills and lowlands of central Panama. It is one of the most common and distinctive of all the canopy epiphytes in the areas where it grows. Very few other species of Sphaeradenia occur at low elevations.

RELATIONSHIPS. Although S. pendula resembles S. ensiformis even in many details of the flowers, it is nevertheless a quite different species. The leaves of S. pendula are much longer than and never as wide as those of S. ensiformis. Sphaeradenia pendula occurs at lower elevations than S. ensiformis but the two can be found sympatric at elevations of about 300-500 m. The male flowers are about half the size of those of S. ensiformis and they have fewer perianth lobes.

The fruits of S. ensiformis are described as changing from green to red to yellowish white at maturity whereas those of S. pendula apparently remain green or become somewhat yellowish. The fruits of S. ensiformis are said to be very fragrant at maturity. This is true also at least for some individuals of S. pendula; the fruits of the plant here figured had a very strong fragrance of Juicy Fruit gum. Because of their brightly colored and juicy (non fragrant) mature fruits with dehiscent caps, most species of Sphaeradenia would appear to be bird dispersed. However, S. pendula and several closely related species with green to yellow-green, very hard leathery or rubbery, indehiscent and at least sometimes fragrant fruits seem more likely to be dispersed by bats or other mammals. Nevertheless, old fruiting spadices of S. pendula and related species are often found intact, fallen or on plants, but dry and almost woody, the fruits containing still turgid seeds. These spadices are sometimes also found covered with their own seedlings, the seeds having germinated in situ.

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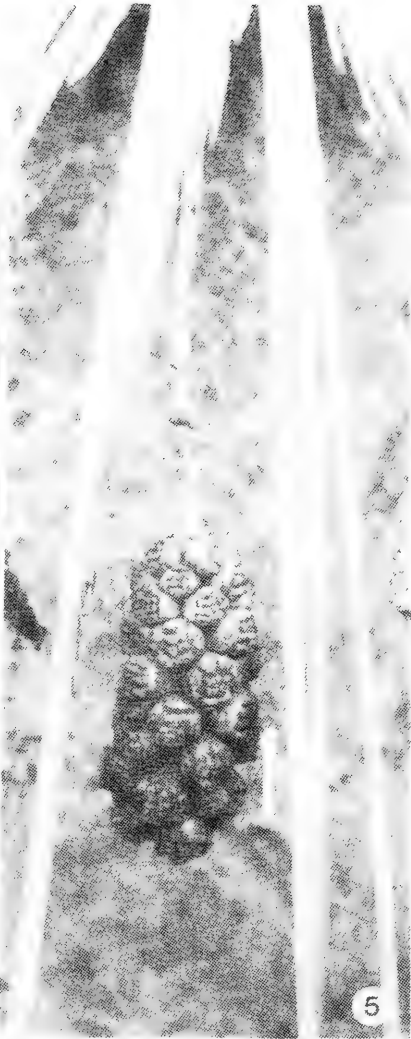
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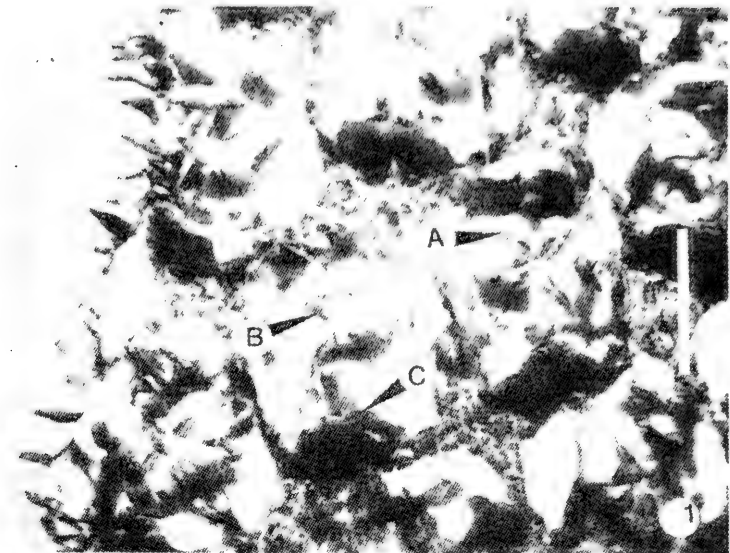
FIGURE CAPTIONS

Figure 1. Carludovica sulcata, mature spadix. A, stigma. B, base of staminodium. C, pistillate tepal. (Hammel 13246; scale bar = 1 cm).

Figures 2 and 3. Dicranopygium umbrophila. 2. Habit (scale bar = 10 cm). 3. Mature spadix (scale bar = 1 cm). (Hammel 12386).

Figures 4 and 5. Sphaeradenia pendula. 4. Habit (scale bar = 1 m). 5. Mature spadix (scale bar = 2 cm). (Hammel 13708).





ELEVATION IN PLEIOSTACHYA (MARANTACEAE)

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Examination of specimens from throughout Central America (Hammel, unpubl. data) indicates that bract size and shape are useful for distinguishing among the three species of Pleiostachya but bract pubescence, which traditionally has been used to separate two of the species (Croat, 1978; Schumann, 1902; Standley, 1937; Woodson & Schery, 1945), is misleading. On the basis of this revised taxonomy and the type descriptions, P. morlae (Eggers) Schum. appears to be a later synonym of P. pruinosa (Regel) Schum. These observations lead to the conclusion that the species with the largest bracts is without a name.

A little known variety of P. morlae fits the concept of the large-bracted entity and is here elevated to species. This move is necessitated by the impending publication of the Marantaceae for the Flora of La Selva (Hammel, 1986) where both P. pruinosa and the newly recognized species occur.

Pleiostachya leiostachya (Donn. Sm.) Hammel, stat. nov.
P. morlae var. leiostachya (Donn. Sm.) Standl. Field Mus. Nat. Hist. Bot. 18:196. 1937. Ischnosiphon morlae var. leiostachya Donn. Sm., Bot. Gaz. 31:123. 1901. Type: Costa Rica, Cartago, Tonduz 12884 (lectotype US!).

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REVISION DE DOS SECCIONES DEL GÉNERO CUPHEA P. Browne (LYTHRACEAE)

Alicia Lourteig

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ABSTRACT. Two Sections of Cuphea are revised and all its taxa are typified. C. rigidula, from Section Heteranthus Koehne, is transferred to Section Amazoniana Lourt. for which 3 new species: C. boliviariensis, C. curiosa and C. Killippii are described. A number of new synonyms and a new key for Section Pseudocircaea Koehne are provided and C. Scolnikiae n. sp. is described.

Con el fin de preparar la Monografía de Litáceas Sudamericanas, así como mi contribución en las Floras en preparación, creo necesario tipificar y delimitar los taxones, reorganizar las Secciones de géneros y poner en evidencia los problemas que puedan surgir.

Las dos secciones que reviso son de interés especial. Mientras que una ha sido desconocida porque la región en la cual vive ha sido explorada en tiempos modernos, la otra está recargada de sinónimos quizás por que los tipos provienen de localidades alejadas y hasta principios de este siglo existían muy pocas colecciones.

Sectio Amazoniana Lourt.

Lourteig, Notas Mus. La Plata 19: 280. 1959.

Subsectio Hilaireae Koehne Ser. 1 et Ser. 2 (pro min. parte, C. cataractarum) in Martius, Fl. Brasil. 13(2): 226-227. 1877 (typ. excl.).

Subsectio Hyssopocuphea Koehne, Bot. Jahrb. 1: 441. 1881 p.p. typ. excl.; Ib. 2: 152. 1882 p.p.; in Engler, Pflanzenreich 216: 84, 91, 127 p.p. typ. excl.

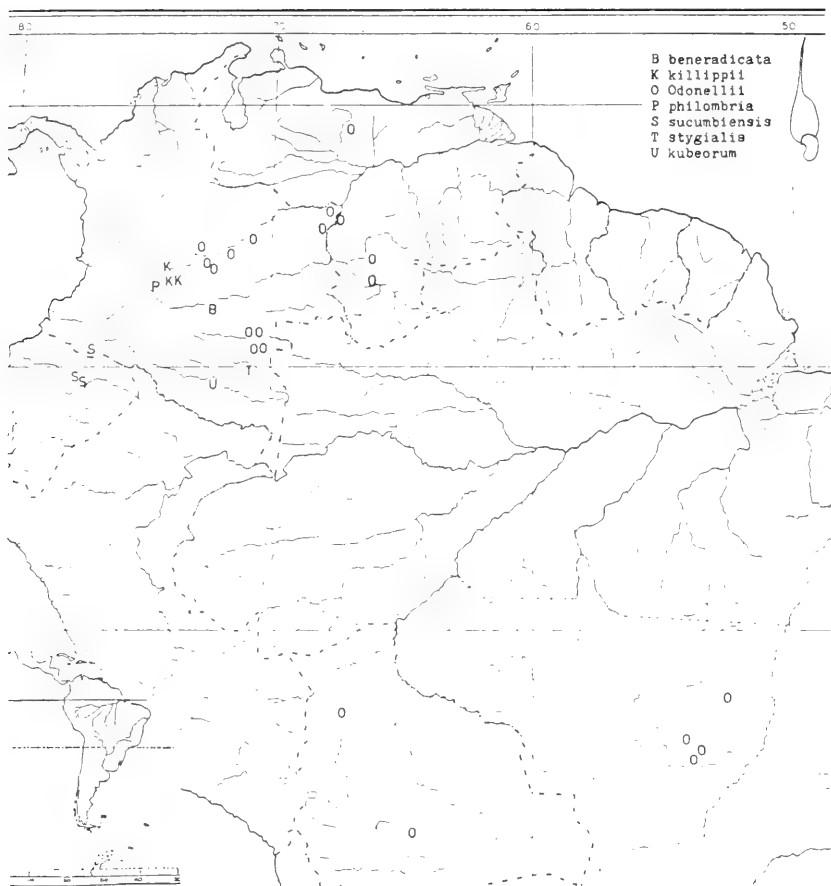
Lectótipo : Cuphea cataractarum Koehne

Koehne estableció su Subsección Hyssopocuphea cuyo tipo es C. Hyssopifolia H.B.K. e incluyó en ella 5 especies. Dos, C. cataractarum y dactylophora son distintas de tal modo que es posible reunir las con otras especies en la Sección creada por mí.

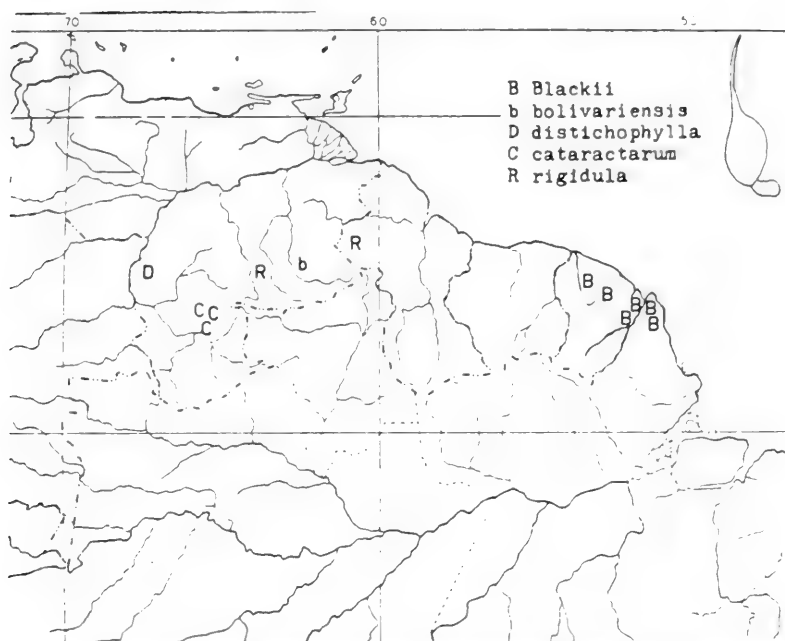
La pubescencia malpighiácea es un carácter común, los 2 pétalos dorsales son en general algo menores y más anchos. Todas las especies viven en la región guayano-amazoniana, algunas en endemismo limitado, otras en regiones húmedas más extensas, siendo C. Odonealii la que ocupa el área mayor, hallándose la desde Venezuela hasta Bolivia.

La ecología es la misma, en términos generales, para todas las especies, regiones húmedas, soleadas, aguas claras, terrenos arenosos; sin embargo, algunas se hallan en los inselbergs o en afloramientos graníticos, en savanas.

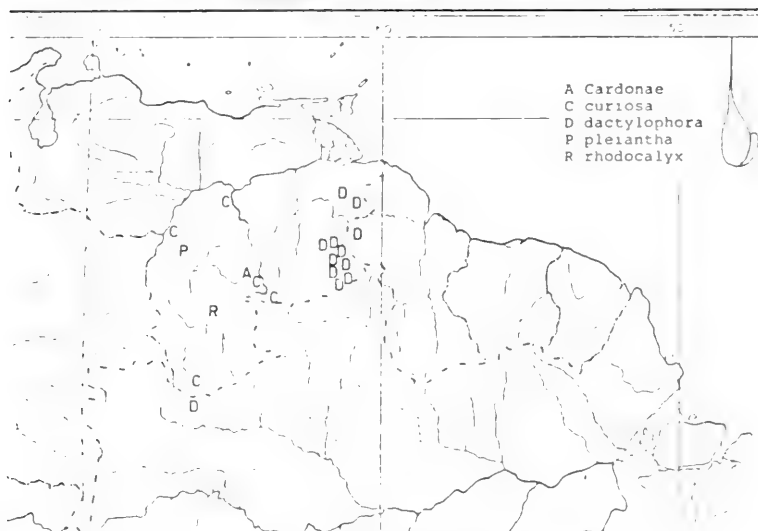
Describo 3 especies nuevas, cambio de rango una variedad que pasa a especie e incluyo una especie ubicada hasta hoy en otra Sección.



Mapa 1. Distribución geográfica de especies con disco glandular deflexo



Mapa 2. Distribución geográfica de especies con disco glandular subhorizontal (*C. rigidula* en Guayana, aproximativa).



Mapa 3. Distribución geográfica de especies con disco glandular erecto (*C. dactylophora* en Guayana, aproximativa).

Dentro de la Sección se pueden separar tres grupos definidos por su disco glandular. Particularmente dos grupos presentan discos en posición uniforme : deflexo (7 especies) y el otro erecto, cilíndrico, a menudo adosado al ovario (5 especies). El otro grupo no es tan uniforme como los citados: los discos glandulares adoptan una posición \pm horizontal, pudiéndose establecer una graduación desde horizontal- deflexo hasta horizontal-ascendente.

1. En el grupo con disco deflexo, éste es semiovoideo, en general grueso, más ancho que largo (*C. kubeorum*) hasta más largo que ancho, menos grueso (*C. succumbiensis*). Todas las especies habitan en Colombia amazónica, una de ellas llega hasta la frontera ecuatoriana y otra vive desde Venezuela hasta Bolivia. Su hábito es muy uniforme a excepción de *C. Udonellii* de amplia distribución ; *C. kubeorum* es la más característica.

2. El grupo intermedio presenta el disco en posición horizontal-ascendente a subdeflexa; es en general globuloso o algo alargado (oblongo), no cilíndrico delgado. En cuanto a la posición podríamos establecer una escala : subascendente-globoso (*C. distichophylla*), subascendente-oblongo (*C. cataractarum*, *C. rigidula*), subhorizontal-globoso (*C. Blackii*), ovoideo subhorizontal-descendente. Una especie vive en una zona limitada en la frontera de Brasil y Guayana Francesa, región del Oyapok.

3. El tercer grupo que es el más diferenciado y el más característico presenta el disco glandular cilíndrico o subulado erecto, en general adosado al ovario. Hasta ahora sus especies son venezolanas, a excepción *C. dactylophora* que se halla en Guayana y en la frontera brasileña (Pico de la Neblina). De ellas, esta última especie presenta la distribución mayor y como consecuencia una variación ecológica (cuantitativa) en sus caracteres vegetativos; las otras son muy uniformes.

La distribución geográfica de las especies, por grupos con la característica citada no deja de ser llamativa. Pareciera que en algún sitio de la región guayano-amazoniana se hubiera producido una explosión de especies de las cuales algunas se aislaron conservando un carácter peculiar. Estas especies constituyen casos de vicariancia según el concepto clásico, observándose además ejemplos de vicariancia por pares (Lourteig, 1986).

Podríamos decir que un tipo morfológico está confinado al Macizo de La Macarena en Colombia (disco deflexo, v. Mapa 1) y el otro a los bancos rocosos, tepuis, de la guayana venezolana (disco erecto, v. Mapa 3). Podría imaginarse que el otro grupo, menos uniforme y con mayor distribución (Brasil, Colombia, Venezuela, Bolivia, v. Mapa 2) estableciera la relación de ambos grupos con sus estados intermedios, pero hasta ahora, en ningún caso presentan discos comparables a los de los grupos extremos ni viven en las mismas regiones.

Clave de las especies

A. Disco deflexo, semiovoides a subtriangular

a. Tallos setoso-pubescente

b. Corola rosada a violácea (a veces blanquecina)

c. Disco triangular, angosto, largo; apéndices ca.
calicinos malpighiáceo-pubescentes.....1. *sucumbiensis*

c: Disco semiovoides, obtuso; apéndices calici-
nos dorsales setosos.....2. *philombria*

b: Corola bicolor: 4 pétalos ventrales distintos de los 2 dorsales

d. Haz foliar glabro. Pétalos ventrales blanque-
cinos, dorsales violáceos.....3. *Killippii*

d: Haz foliar malpighiáceo-pubescente. Pétalos
ventrales rosados, dorsales violáceos.....4. *beneradicata*

a: Tallos malpighiáceo-pubescentes

e. Cáliz sin setas. Pelos malpighiáceos finos.

f. Ovario piloso.....5. *kubeorum*

f: Ovario glabro.....6. *Odonellii*

e: Cáliz setoso y malpighiáceo-pubescente. Pelos
malpighiáceos gruesos con cistolito prominen-
te, anisobraquiados h. casi 1-braquiados.....7. *stygialis*

A: Disco no deflexo

a. Tallos malpighiáceo-pubescentes

b. Plantas densamente pubescentes

c. Disco horizontal ovoides

d. Apéndices calicinos dorsales sin setas
largas. Fl. decusadas o alternas inter-
peciolares.....8. *bolivariensis*

d: Apéndices calicinos dorsales con setas
muy largas. Infl. generalmente largas con
hipsófilas.....11. *Blackii*

c: Disco cilíndrico erecto adosado al ovario

e. Corola rosada.....13. *dactylophora*

e: Corola bicolor: 2 pétalos dorsales violá-
ceos con pelos en la base del dorso del
nervio, los otros rosados.....14. *curiosa*

h. = hasta; Fl. = flor; Infl. = inflorescencia

b. Plantas poco pubescentes h. casi glabras

f. Corola bicolor: pétalos ventrales blanquecinos, dorsales violáceos con pelos blancos en la base del dorso del nervio.....15.pleiantha

f. Corola rosada. Pétalos glabros.....17.rhodocalyx

a. Tallos malpighiáceo-pubescentes y setosos

b. Hojas malpighiáceo-pubescentes

c. Cáliz densamente pubescente

d. Hojas rígidas densamente imbricadas. Pocas Fl. purpúreas en el ápice de los ramos....10.distichophylla

d. Hojas membranáceas ± laxas. Fl. a lo largo de los ramos, blanquecinas a violáceas

e. Corola blanquecina. Fl. alternas en la mitad superior de los ramos..... 9.cataractarum

e. Corola rosada, 2 pétalos dorsales más oscuros. Fl. generalmente en Infl. con hipsófilas.....14.curiosa

c. Cáliz poco pubescentes h. casi glabro.....16.Cardonae

b. Hojas malpighiáceo-pubescentes con ciliis y setas largas.....12.rigidula

1. *Cuphea sucumbiensis** Lourt.

Lourteig, Bot. Mus. Leaflets (Harvard) 16(8): 225-226, lám. 36.1954; Notas Museo La Plata 94: 281.1959; Sellowia 16: 137, 139.1964. Tipo: Colombia, Putumayo, frontera colombo-ecuatoriana, selva higrófila, Río Sucumbíos (San Miguel), entre los afluentes Conejo y Hormiga, 300 m, Cuatrecasas 11069a 15 XII 1940 Holót. F. Isót. COL, P, US.

Subarbusto (h. 35 cm) de base leñosa, ramificado. Ramas delgadas con abundantes setas ascendentes, ferrugíneas con base engrosada. Internodios menores que las hojas (± 3 mm). Hojas muy aproximadas, sésiles o subsésiles. Pecíolo grueso, rojizo, setoso como las ramas. Lámina linear-lanceolada a linear (3-15 x 0,6 - 2 mm) discolor, obtusa o aguda, pubescente en ambas faces, haz glabrescente h. casi glabro, nervio central prominente en el envés, rojizo, pubescente y setoso; margen incurvado. Flores alternas, raro decusadas, hacia el ápice de los ramos entre las hojas. Pedúnculos infrapeciolares (2,5 mm) pubescentes. Bracteoas ca. del ápice del pedúnculo, gruesas, ovadas (± 0,5 mm) obtusas.

Cáliz grácil (4-5 mm) adpreso-malpighiáceo-pubescente y setas en la parte inferior mezcladas, lóbulos agudos, apéndices gruesos ± iguales. Interiormente pelos sobre los nervios dorsales y ± esparcidos, pequeños sobre los otros nervios, lanoso detrás de los estambres. Pétalos lilá-

*El epíteto refiere a la localidad típica.

ceos a blanquecinos, obovados u oblongos, los 2 dorsales algo más anchos (2,5 - 2,75 x 1-2 mm). Estambres 11, en la parte media superior del cáliz, los dos dorsales brevísimos, los 3 ventrales, episépalos, glabros, los otros ± pilosos. Disco glandular grueso (0,5 - 0,6 mm) triangular-ovoideo, algo aplanado, deflexo. Ovario ovoideo-asimétrico, glabro o con pelos cortos esparcidos. Estigma subcapitado. Ovulos 10 - 12.

Semilla parda, suborbicular (± 1 mm), aplanada, apenas marginada, finamente foveolada.

Distribución geográfica. Especie del S de Colombia y N de Ecuador, que vive en bordes de selva y de ríos, en suelos rocosos.

Material estudiado. COLOMBIA. Putumayo, Río Sucumbios, San Miguel, 300 m, Cuatrecasas 11069a 15 XII 1940 COL, F, P, US.

ECUADOR. Napo. Lago Agrio, Río Oyacachi, 23 Km fr. Baeza, 1500 m, Balselev & E. Madsen 10506 31 X 1976 AAU, P. Pastaza a Borja (Virgilio Dávila), 650 m, Harling 3849 15-26 I 1959 P, S.

2. *Cuphea philombria** Lourt.

Lourteig, Bot. Mus. Leaflets (Harvard 16(8): 223-225, lám. 36. 1954; Notas Museo La Plata 94: 281. 1959. Tipo: Colombia. Meta, Sierra La Macarena, extremo NE, Rengifo, 1300 - 1900 m, rocky banks Idrobo y Schultes 1062 6-20 I 1951 Holót. GH. Isót. COL, P, US.

Arbusto (± 50 cm) decumbente, rápidamente erguido. Raíces fibrosas, profusamente ramificadas (h. 30 cm largo). Tallos subleñosos en la base (5 mm diám.), ramificados dicotómicamente; setas rojizas y pelos malpighiáceos de ramas desiguales, blancos. Internodios (0,5 - 1 mm) menores que las hojas. Hojas sésiles o subsésiles, uninervadas. Pecíolo grueso. Lámina discolor, linear-lanceolada (15- 30 x 4,5 - 8 mm), haz poco pubescente, envés malpighiáceo-pubescente, aguda u obtusa; nervio impreso en el haz, conspicuo en el envés. Flores alternas, raro decusadas, entre el follaje. Pedúnculo interpeciolar (± 4 mm), delgado, pubescente. Bractéolas gruesas, pequeñas (ca. 0,5 mm) suborbitales, rojizas.

Cáliz violáceo, enangostado a 2/3 de su longitud, ensanchado en la fauce; calcar oblicuo, subagudo; malpighiáceo-pubescente y setoso-glanduloso (setas violáceas); lóbulos pubescentes, anchos; apéndices subulados, setosos, menores que los lóbulos. Interiormente cortamente pubescente, lanoso detrás de los estambres. Pétalos violáceos, obovado-cuneados (4,5 - 7 x 2,5 - 3,5 mm) obtusos. Estambres dos dorsales cortísimos, 3 ventrales episépalos glabros, los otros pilosos. Disco glandular carnoso, grueso, deflexo, obtuso. Ovario semiovoideo-asimétrico (± 3 mm), cortamente pubescente. Estilo incluso, poco piloso. Estigma subcapitado, papiloso. Ovulos 12 - 15.

Semilla parda, suborbicular-aplanada (± 1,5 mm, inmadura), finamente foveolada.

Distribución geográfica. Endémica de la región de La Macarena.

*El epíteto, derivado del griego (= amigo de la lluvia) alude a la ecología de la planta, en selva lluviosa.

Material estudiado. COLOMBIA. Meta. Sierra La Macarena, Renjifo, 1300-1900 m, Idrobo y R.E. Schultes 1062 6-20 1951 COL, GH, P, US. Mt. Macarena, plateau, 3800 ft., E.T. Gilliard 21 I 1942 NY,P.

3. *Cuphea Killipii* Lourt. sp. n.

Herba usque 40 cm alta. Rami fibrosi ramosi, longi. Caule erecto vel decumbente, profuse ramoso; pubescentia adpressa malpighiacea, tenuissima, ramis pilorum brevibus, et setis violaceis intermixtis. Folia linearia vel lanceolata (7 - 22 x 0,5 - 4 mm) 1-nervata vel interdum 2 nervis sub-basalibus, in folia latiora 3 paribus nervorum secundatium ascendentibus, tenuissimorum; supra glabra, nervo centrali parum piloso, subtus pubescentia laxa, adpresso-malpighiacea, supra nervo centrali nonnullis setis brevibus.

Flores alternae, interpetiolares. Pedúnculo (3,5 - 7 mm longo). Bracteolae ovatae, setosae (\pm 0,4 mm).

Calyx (4 - 6 mm) viride-violaceus, malpighiaceo- et setoso-pubescentis; calcar obtuso; fauce ampliatus; appendices intersepálici subulati quam lobuli longii vel minores. Intus subtiliter pubescens et lanato-pubescentis pone staminam. Petala sex anguste oblonga dua dorsalia violacea, ventralia lilacea aut albida (fide coll.). Stamina inclusa, epispala longiora, 3 glabra, epipetala pilosa. Discus deflexus, crassus, subtriangularis. Ovarium \pm pubescens. Stylus parum pilosus, inclusus. Ovula 9 - 10.

Typus: Colombia, Intendencia Meta, north side of river near junction of Güejar and Zanza rivers, N end of Cordillera Macarena, on sedimentary rocks, river bank, dense forest, 500 m, Galen, Smith and Idrobo 1480 20 VIII 1950 Holst. GH. Isót. COL, UC, US.

Hierba (hasta 40 cm). Raíces fibrosas, largas, ramificadas. Tallo erecto, decumbente luego erecto (h. 5 mm diám. en la base), profusamente ramificado, purpúreo-rojizo, pelos malpighiáceos adpresos muy finos de ramas cortas, y setas gruesas, rojizas, ascendentes, abundantes. Internodios 1 - 5 mm. Hojas decusadas, sésiles. Lámina linear o lanceolada (7 - 22 x 0,5 - 4 mm) 1-nervada, nervadura rojiza, a veces 2 basales y en láminas anchas 3 pares ascendentes muy tenues; borde \pm recurvado; haz glabro (a veces pocos pelos sobre la nervadura media); envés pubescencia malpighiácea fina, adpresa, a ramas algo desiguales, laxa, algunas setas cortas sobre la nervadura. Flores pequeñas, alternas. Pedúnculos interpeciulares, (3,5 - 7 mm) pubescentes como el tallo. Bractéolas a 2/3 de la base, ovadas, acuminadas, setosas (\pm 0,4 mm).

Cáliz (4-6 mm) verdoso-violáceo, malpighiáceo y setoso-pubescente, dorso recto, ensanchado en la fauce; calcar redondeado; apéndices intersepálicos subulados, menores o \pm iguales a los lóbulos. Interiormente finamente pubescente y detrás de los estambres lanoso. Pétalos angostamente oblongos, rosados a blanquecinos (fide coll.), los dorsales purpúreos, borde subcrenado (3 - 4 x 1- 2,25 mm). Estambres inclusos, los

* Dedicada a Ellsworth Paine Killip (1890-1968) botánico estadounidense quien efectuó importantes colecciones en Colombia y se ocupó de la flora sudamericana.

episépalo llegan cerca del borde del cáliz, 3 glabros, los otros pilosos. Disco deflexo, grueso, subtriangular. Pistilo incluído. Ovario tpu-beascente, Estilo pubescente, \pm del largo del ovario. Estigma pequeño, poco conspicuo. Óvulos 9- 10.

Semilla parda, suborbicular-obovoideo-aplanada (\pm 1 mm), finamente foveolada.

Distribución geográfica. Vive en la región de La Macarena, pero aislada de *Cuphea philombria*, en el valle del Güejar y sus afluentes.

Material estudiado. COLOMBIA. Meta. Near junction of Güejar and Zanza rivers, 500 m, Galen Smith and Idrobo 1480 20 VIII 1950 COL, GH, UC, US. Sabanas de San Juan de Arana, ca. "Los Micos", ca. 500 m, Idrobo y R.E. Schultes 564 5 - 20 XII 1950 COL, GH. Sierra de La Macarena, Río Guayapa, 450 m, Philipson, Idrobo and Fernández 1609 29 XI 1949 BM, COL, US. Reserva Macarena, Mun. San Juan de Arana, Luchilla del Neme, left of Río Güejar, Thomas, Hernández and Pinto 1467 21 I 1968 COL, P. Unión de los ríos Zanza y Güejar, 490 m, Idrobo y Jaramillo 2047 22 II 1956 COL.

Cercana a *C. philombria* de la cual se diferencia por los colores de la flor, la forma del cáliz no enangostado en la fauce, el calcar corto, los pétalos más pequeños y de otra forma. Los pelos malpighiáceos de las hojas son más largos y más visibles en *C. philombria*.

Vecina a *C. beneradicata* de la cual se diferencia por la pubescencia del cáliz y del ovario, la nervadura media fina prominente en el envés con setas (en *C. beneradicata* es ancha, plana) e impresa en el haz, la forma de sus hojas más pequeñas y obtusas y la forma del cáliz.

4. *Cuphea beneradicata* * Lourt.

Lourteig, Bot. Leaflets (Harvard) 16(8): 226-227, lám. 37. 1954. Notas Museo La Plata 94: 281. 1954. Tipo: Colombia, Vaupés, Mesa La Lindosa, 15 - 20 Km de San José del Guaviare, 400 - 600 m, J.M. Idrobo & R.E. Schultes 640 13 - 15 XII 1950. Holót. GH. Isót. COL, P.

Suarbusto (20 - 25 cm); base leñosa. Tallo grueso, tortuoso, blanco-malpighiáceo-pubescente y en los ramos jóvenes pelos glandulosos, hirsutos, purpúreos. Internodios menores que las hojas (2 - 4 mm). Hojas subsésiles. Pecíolo \pm 0,6 mm, grueso. Lámina lanceolada a linear, obtusa margen recurvado (8- 11 x 1 - 3 mm); nervio medio ancho, rojizo, notable en el envés; pubescencia densa adpreso-malpighiácea en ambas faces, algo menos en el haz, en las hojas jóvenes cilias largas, glandulosas, tenues. Flores decusadas, raro alternas, en el ápice de los ramos. Pedúnculo 2- 2,5 mm, interpeciolar. Bractéolas en el ápice de los pedúnculos, ovado-acuminadas (0,5 mm), pubescentes.

Cáliz (5 - 5,5 mm) malpighiáceo-pilosos (pelos \pm hirsutos) y abundantes pelos viscidos, purpúreos hacia la parte inferior; lóbulos anchos acuminados; apéndices intersepálicos gruesos, pubescentes, tan largos como los lóbulos; calcar notable, incurvado, obtuso. Interiormente nervios pubescentes, detrás de los estambres lanoso. Pétalos rosado-purpú-

* Así llamada porque la planta está firmemente implantada en las fisuras de las rocas no habiendo sido posible obtener su raíz.

reos (3,5 x 1,5 mm) oblongos a obovado-oblongos. Estambres episépalos llegando al borde del cáliz, los 3 ventrales glabros, los otros lanosos. Disco glandular deflexo, ovoideo, aplanado, obtuso. Ovario semiovoideo-asimétrico, densamente pubescente. Estilo delgado, pubescente. Estigma subcapitado. Ovulos 4 - 6.

Semilla pardo-oscuro, suborbicular (1,25 mm), levemente marginada, finamente foveolada.

Distribución geográfica. Endémica de la región del Vaupés.

Material estudiado. COLOMBIA. Vaupés. Mesa La Lindosa, 15 - 20 Km S de San José del Guaviare, 400 - 600 m, Idrobo and Schultes 640 13 XII 1950 COL, GH, P. San José del Guaviare, 270 m, Cuatrecasas 7691 12 XI 1939 COL, P, US.

5. *Cuphea kubeorum** Lourt.

Lourteig, Bot. Leaflets (Harvard) 16(8): 221-222, lám. 35. 1954; Notas Mus. La Plata 94: 281. 1959. Tipo. Colombia, Vaupés, Río Kubiýú (tributary of Río Vaupés), Cerro Kañendá, savannahs about 15 miles upstream from mouth. Quartzite base, ab. 800 - 900 feet, R.E.Schultes & I.Cabre-
ra 18306 10 XI 1952 Holót. GH.

Subarbusto (h. 45 cm) malpighiáceo-pubescente. Pubescencia de pelos muy finos, blancos, ramas hirsutas en ángulo agudo. Rizoma cilíndrico (h. 20 cm largo) con raíces fibrosas. Tallos de base subleñosa, gruesos, ramificados desde la superficie del terreno, decumbentes, densamente pubescentes. Internodios variables (3 - 20 mm). Hojas generalmente aproximadas, subsésiles. Pecíolos delgados, cortísimos. Lámina discolor, linear (h. 8 x 1 mm), obtusa, haz pubescente, envés glabro, margen recurvado; nervio central ancho, impreso en el haz, prominente en el envés. Flores alternas o decusadas. Pedúnculo generalmente infrapeciolar (\pm 2 mm), interpeciolar. Bractéolas ovadas (\pm 0,3 mm), pubescentes.

Cáliz (4,5 mm) enangostado hacia la mitad, fauce dilatada; calcar conspicuo, oblicuo recurvado, obtuso; pubescencia malpighiácea corta uniforme; lóbulos anchos, acuminados; apéndices largos como los lóbulos o menores. Interiormente densamente pubescente, lanoso detrás de los estambres. Pétalos violáceos, elípticos u oblongos (2 - 2,5 x 0,25 - 1 mm) obtusos. Estambres inclusos, alcanzando el borde del cáliz los episépalos a la madurez, 3 de ellos glabros, los otros pubescentes. Disco glandular grueso, deflexo, ancho, obtuso. Ovario semiovoideo-asimétrico, densamente pubescente. Estilo delgado, incluso, pubescente. Estigma capitado. Ovulos 2 - 4.

Semilla pardo-oscuro, suborbicular, aplanada (\pm 1,5 mm), poco marginada, finamente foveolada (generalmente 3).

Distribución geográfica. Endémica de la región del Vaupés, pero aislada de C. beneradicata.

* El epíteto hace alusión a los indios Kueo que habitan en el área donde crece esta especie.

Material estudiado. COLOMBIA. Vaupés. Río Kúbiyú, ca. 350 m, H. Humbert et Schultes 27339 9-10 XI 1952 P. Río Caquetá, Araracuara, camino a La Sabana de Tibeyes, Sastre y Raichel 5115 4 I 1977 COL, P. Río Cuduyuni, Cerro Yapoboda, 450 m, Schultes y Cabrera 14389 5-6 X 1950 GH, P. Río Karurú, Mesa de Yambí, savana Goo-ran-hoo-dá, 950 - 1000 ft., Schultes y Cabrera 19177 15-16 IV 1953 GH, P. Mitú and vicin., lower Río Paraná-Pichuna, Zarucchi 2011 9 IX 1976 P, US. Río Kúbiyú, Cerro KaMandá, 800 - 900 ft., Schultes y Cabrera 18306 GH. Río Paraná-Pichuna, 700 ft., Schultes y Cabrera 19913 VI 1953 GH.

6. *Cuphea Odonellii* * Lourt.

Fig. 1 A

Lourteig, Notas Mus. La Plata 94: 281-284, fig. 1959; *Sellowia* 16: 136-137. 1964. Tipo: Bolivia, Dep. Santa Cruz, Prov. del Sara, Campos de Buenavista, 500 m, Steinbach 6163 5 VII 1924 Holót. K. Isót. BM, LIL p.p., P.

Herbácea. Raíces fibrosas muy ramificadas. Tallo semiprostrado, decumbentes, apoyante, de base subleñosa, a veces muy largo (h. 1 m), elevándose poco del suelo, profusamente ramificado; malpighiáceo-pubescente (pelos blanquescinos de ramas desiguales, adpresas algo oblicuas). Internodios 1 - 15 mm. Hojas subsésiles. Pecíolo grueso (0,5 mm largo). Lámina linear-lanceolada (8 - 30 x 1,5 - 6 mm), aguda, nervadura media rojiza, prominente en el envés, h. 6 pares de nervios secundarios y una nervadura colectora marginal, a veces inconspicuas; pubescencia adpresa densa en ambas faces, a veces haz glabrescente. Flores alternas, muy raro decusadas, entre las hojas. Pedúnculo interpeciolar (h. 1 mm). Bractéas en el ápice del pedúnculo, ovadas (0,5 - 0,7 mm) agudas, pubescentes. (A veces muy desarrolladas y de aspecto foliáceo).

Cáliz (5 - 7 mm) uniformemente malpighiáceo-pubescente, en forma de ampolla en el fruto; fauce ampliada; calcar obtuso; lóbulos dorsales algo mayores; apéndices intersepálicos gruesos, menores que los lóbulos. Interiormente pubescente sobre los nervios, más los dorsales, lanoso detrás de los estambres. Pétalos rosado-liláceos, oblongo-subespatulados (\pm 2,5 - ca. 1 mm), obtusos. Estambres inclusos, los episépalos mayores, 3 de ellos glabros, los otros apenas lanoso-pubescentes hacia la base. Disco glandular grueso, delfexo. Ovario semiovoideo-asimétrico (\pm 2 mm), glabro. Estilo fino (\pm 2 mm), glabro. Estigma subcapitado, papiloso. Ovulos 3 - 6.

Semilla parda (2 - 2,25 mm) obovoideo-aplanada, finísimamente foveolada (generalmente 2).

Distribución geográfica. Desde el N de Venezuela hasta Bolivia, en terrenos arenosos y húmedos, bordes de selvas de galería, savanas, hasta 500 m de altitud.

Material estudiado. VENEZUELA. Miranda. Morichal El Recreo, 75 m, Delas-

* Dedicada a Carlos Alberto O'Donell (1912-1954) botánico argentino conocido particularmente por sus estudios sobre Convolvuláceas.

- cio y R. Montes 11759 VII 1982 VEN. Guárico. Estación Biológica Los Llanos, Lourteig 1772 27 V 1966 P. Ib., Hato Becerre, Estero del Río Guariquito, Blydenstein 491 2 VIII 1962 VEN. Morichal Hato El Recreo, ca. Estación Biológica Los Llanos, Aristeguieta 6187 6 VIII 1966 VEN. Distr. Infante, Parque Nacional Aguaro - Guariquito, Morichal San Ramón, 100 m Delascio et al. 11463 XII 1981. 'b., Morichal Charcote, 68 m, Delascio et al. 11115 XII 1981 VEN. Amazonas. Atures, Caño Coro-Coro (affl. del bajo Ventuari) ca. 20 Km SW Cerro Moriche, 130 m, Huber 3214 19 II 1979 P, VEN. Río Orinoco, Raudal Atures, El Zamuro, Pinto y Sastre 1351 18 III 1971 COL, P. Cerro Yapacana, 125 m, Steyermark & Bunting 103224 7 V 1970 P, VEN. Apure, Distr. Rómulo Gallegos, betw. Laguna del Término and Río Capanapero, 90 m, Davidse & A.C. González 16111 7 III 1979 VEN. Distr. Pedro Cornejo, Caño El Caballo, betw. Río Meta and Río Cinaruco, 75 m, Davidse & González 15853 27 II 1979 VEN.
- COLOMBIA. Boyacá. Esteros de las Garzas, 9 Km SE de Mani, Sastre 803 22 1971 COL, P. Caño Casimenes, 16 Km de Santa Elena, Sastre 881 26 II 1971 COL, P. Vichada. Carretera a Puerto Carreño, Hato El Tigre, margen del Caño El Tigre, Pinto y Sastre 1225 11 III 1971 COL, P. Raudal San Borja, Ventanas, margen izquierda del Río Orinoco, ca. 100 m, Pinto y Sastre 1292 17 III 1971 COL, P. Entre Puerto Carreño y Puerto Gaitán, 20 Km de Monserrate, ca. 150 m, Pinto y Sastre 1415 20 III 1971 COL, P. Entre Puerto Carreño y Puerto Gaitán, Fundo El Delirio, Bajo "Rompe Cajas", ca. 150 m, Pinto y Sastre 1457 21 III 1971 COL, P. Ib., Pinto y Sastre 1483 22 III 1971 COL, P. Entre Puerto Carreño y Puerto Gaitán, Cerro Quemado, 70 Km de Monserrate, ca. 180 m, Pinto y Sastre 1437 21 III 1971 COL, P. Hacia Puerto Gaitán 25 Km del Hato El Tigre, 150 m, Pinto y Sastre 1508 23 III 1971 COL, P. Cataracta Maypure, Spruce 3728 VI 1854 P. Meta. Lomalinda, près de Puerto Limón, Sastre 2110 5 IX 1973 COL, P. Mun. San Juan de Arana, margen izquierda Cerro Cunibá, Pinto y Bernal 1702 2 IV 1971 COL, P. Mun. Puerto López, Hacienda Mozambique, Laguna de Humacita, Sastre y Pinto 1013 7 III 1971 COL, P. Llanos de San Martín, 300 m, Galen Smith & Idrobo 1399 6 VIII 1950 P, UC. Ca. del Caño La Cueva, Pinto y Sastre 1118 11 III 1971 COL, P. Puerto Gaitán a 2 Km W de la población, 250 m, Pinto y Sastre 1119 11 III 1971 COL, P. 20 Km E de El Porvenir, 250 m, Pinto y Sastre 1200 13 III 1971 COL, P. El Porvenir, Pinto y Sastre 1201 13 III 1971 COL, P. La Serranía, 10 Km de Puerto Lleras, 150 m, Pinto y Sastre 893 18 II 1969 COL.
- BOLIVIA. Santa Cruz. Prov. Sara, Buena Vista, 450 m, Steinbach 2018 27 IV 1916 P, SI. Ib., 500 m, Steinbach 6163 5 VII 1924 BM, K, LIL p.p. Beni Prov. Ballivián, San Borja, 19 Km hacia La Paz, 240 m, S. Beck 6962 21 VII 1981 LPB, P.
- BRASIL. Mato Grosso. Xavantina-Cachimbo Road, 80 Km fr. Xavantina, D.R. Hunt 5782 4 VI 1966 K, P. Barra do Garças-Xavantina 25 Km fr. Xavantina, Hunt & Ferreira 5900 9 VI 1966 K, P. Río Suspiro, 60 Km S Paranatinga, J. M. Pires e P.P. Furtado 17131 17 IX 1980 MG, P. Ca. 2 Km W of Xavantina, J.A. Ratter & R.A. de Castro 185 27 VII 1967 K, P. Ca. 30 Km N of Xavantina, Cachimbo Road, Ratter & de Castro 248 31 VII 1967 K, P. Serra do Roncador, 160 Km N of Xavantina, 500 m, Irwin et al. 16153 27 V 1966 NY, P.

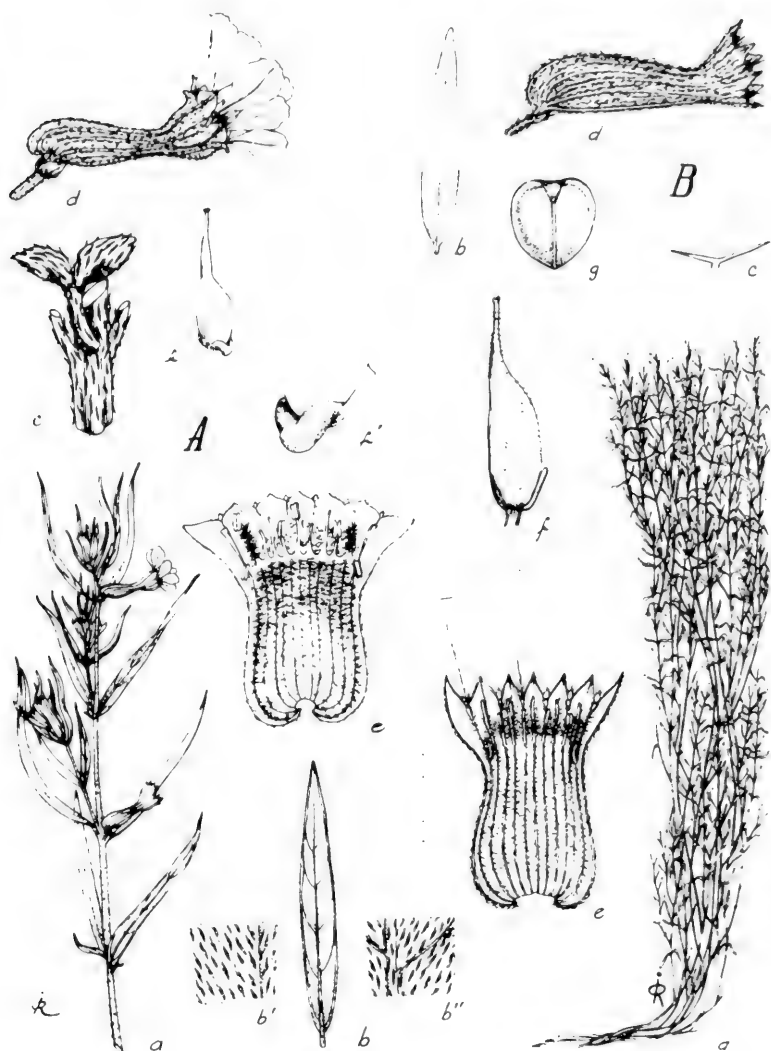


Fig. 1. A, *C. Odonellii*: a, ramo $\times 1,5$; b, hoja $\times 3$; b' haz, b'' envés $\times 10$; c, bractéolas $\times 15$; d, flor $\times 6$; e, interior $\times 6$; f, pistilo y disco $\times 6$; f', disco $\times 12$. B, *C. dactylophora*: a, planta $\times \frac{1}{2}$; b, hoja $\times 2,5$; c, pelo $\times 15$; d, cáliz $\times 5$; e, interior $\times 5$; f, pistilo y disco $\times 5$; g, semilla $\times 5$. J. Pérez Román del.

7. *Cuphea stygialis** Lourt.

Lourteig, Bot. Mus. Leaflets (Harvard) 16(8): 222-223, lám. 37. 1954. Notas Mus. La Plata 94: 281. 1959. Tipo: Colombia, Vaupés, Río Apaporis, Raudal de Jirijirimo (below mouth of Río Kananaří), quartzite base, ab. 900 ft., R.E.Schultes & A. Cabrera 15330 14 II 1932 Holót. GH. Isót.COL, P, US.

Suberbusto (h. 30 cm). Rizoma tortuoso, cilíndrico (h. 20 cm largo, 8 mm diám.). Raíces fibrosas, largas. Tallos ramificados desde la base, erectos o decumbentes (4 mm diám. en la base). pubescentes. Pubescencia uniforme en toda la planta adpresso-malpighiácea. Pelos característicos cáreos, base cistolítica prominente, ramas desiguales, rígidas, a veces una muy reducida. Internodios menores que las hojas (4 - 8 mm). Hojas decusadas, raro verticiladas (de a 3), subsésiles. Lámina discolor, lanceolada a linear (8 - 18 x 1,5 - 3 mm), obtusa, marginada, nervadura central rojiza, notable en ambas faces; haz glabro o casi glabro, pocos pelos esparcidos sobre el envés. Flores alternas o decusadas. Pedúnculos 2 - 4,5 mm. Bractéolas cerca del ápice del pedúnculo, gruesas, ovadas u oblongas, glabras o con pocos pelos.

Cáliz (4,5 - 5,5 mm) dilatado en la fauce, calcar incurvado; lóbulos triangular-acuminados, cortísimamente ciliados; apéndices intersepálicos gruesos, menores que los lóbulos; densamente malpighiácea-pubescentes o húsido-glanduloso (pelos rojizos) en la mitad inferior. Interiormente densamente pubescente. Pétalos blancos y estríados de violáceo, obovado-subespatulados (2,5 - 2,6 x 1,5 - 1,75 mm), obtusos. Estambres dorsales cortísimos, los otros poco mayores, los episépalos algo más largos, 3 de ellos glabros, los otros lanosos. Disco glandular grueso, deflexo, aplanado, ovoideo. Ovario semiovoideo, densamente piloso. Estilo inclusivo, piloso. Estigma capitado. Ovulos 5 - 6.

Semilla pequeña (1 - 1,5 mm) suborbicular, plano-convexa, finísimamente foveolada, carúncula visible.

Distribución geográfica. Endémica de la región del Vaupés.

Material estudiado. COLOMBIA. Vaupés. Río Apaporis, Raudal de Jirijirimo ab. 900 ft., Schultes & Cabrera 15330 14 II 1932 COL, GH, P, US.

8. *Cuphea boliviariensis** Lourt. sp. n.

Fruticulus usque 30 cm altus. Radix fibrosa, ramosa. Caules basi lignosa (\pm 30 cm alti), decumbentes (0,5 cm diám.), dense adpresso-malpighiaceo-pubescentes (pilis tenuibus, brachis longis, inaequalibus). Folia decussata densissima approximata. Lamina linearis (6,5 - 12 x 1 - 2 mm), obtusa, l-nervata, nervo rubro subtus conspicuo; supra glabra, subtus adpresso-malpighiaceo-pubescent. Flores decussati, interpétiolares. Pedicelo crasso in fructificationes acrescenti ad 2,5 mm longo. Bracteolae, subulatae (0,2 - 0,3 mm), glabrae.

* Derivado del griego (= funesto), porque la localidad típica es lugar sagrado de los Indios Apaporis.

* Así llamada porque el tipo fué recogido en el Estado de Bolívar, Venezuela.

Calyx (± 4 mm) calcar obtuso, malpighiaceo-pubescente, fauce ampliatum (\pm ampullaceus in fructibus), lobulis latis quam appendices intersepali longioribus. Intus aecus nervis pilosus, dense lanato-pubescente pone staminem (pilis albidis et purpureis). Petala (colore ignoto) oblonga ($\pm 2,5 - 1,5$ mm). Stamina inserta circa medium tubi calycis, 3 ventralia epispala glabra, epipetala lanoso-pilosa. Discus crassus, ovoideus, obtusus, subhorizontalis-descendens. Ovarium leviter hirsuto-pilosum. Stylus ad basim pilosus, post anthesim exsertus. Stigma subcapitatum. Ovula 3.

Semina brunnea (± 1 mm inmaturo) tenuiter foveolata.

Typus: Venezuela, Est. Bolívar. Mun. Urimán, Río Apacará, 500 m, L. Bernardi 1415 14 VIII 1954 Holót. NY. Isót. MER.

Subarbusto (± 30 cm) decumbente, Raíces fibrosas, ramificadas. Tallos leñosos (h. 50 cm largo y 0,5 diám. en la base), ramificados desde la base, oscuros. Internodios cortísimos (1,5 - 2,5 mm), densamente adpreso-malpighiaceo-pubescente (pelos finos, ramas largas desiguales), las inserciones peciolares dejan cicatrices esclerificadas; densamente foliado hacia los ápices. Hojas decusadas, subsésiles. Pecíolo (0,25 - 1,5 mm) grueso. Láminas lineares (6,5 - 12 x 1 - 2 mm) atenuadas en el pecíolo, 1-nervadas, nervadura notable en el envés, rojiza, obtusa, borde recurvado, haz glabro, envés adpreso-malpighiaceo-pubescente. Flores decusadas, interpeciolares. Pedúnculos gruesos (acrescentes en la fructificación h. 2,5 mm). Bractéolas carnosas, subuladas, diminutas (0,2-0,3 mm), glabras.

Cáliz pequeño (± 4 mm), ensanchado en la fauce (\pm en forma de ampolla en el fruto), calcar obtuso inconspicuo; uniformemente malpighiaceo-pubescente; lóbulos anchos, pubescentes sobre el nervio, mayores que los apéndices intersepáticos que son gruesos, obtusos. Interiormente piloso sobre los nervios, densamente lanoso detrás de los estambres (pelos blancos y purpúreos). Pétalos (color desconocido) oblongos ($\pm 2,5 \times 1,5$ mm). Estambres insertos cerca de la mitad del cáliz, inclusos, los 3 ventrales episépalos glabros, los otros lanosos; anteras pequeñas, oblongas. Disco glandular subhorizontal-descendente, ovoideo, obtuso. Ovario ovoideo-asimétrico, pelos hirsutos, laxos. Estilo fino, incluso, subexserto después de la antesis, piloso en la base. Estigma subcapitado. Ovulos 3.

Semilla parda ($\pm 1,5$ mm diám., inmaturo), finamente foveolata.

Distribución geográfica. Especie riparia de la sabana venezolana.

Material estudiado, VENEZUELA. Dep. Bolívar. Mun. Urimán, Río Apacará, 500 m, L. Bernardi 1415 14 VIII 1954 NY, MER.

Por su porte y aspecto foliar recuerda *C. distichophylla*, diferenciándose entre otros detalles por su disco glandular. De la especie con disco subhorizontal (*C. kuberum* y *C. Blackii*, extra-venezolanas) se distingue por el hábito, el follaje y la pubescencia.

9. *Cuphea cataractarum** Spruce ex Koshke

Fig. 2 B

Koehne in Martius, Fl. Brasil. 13 (2): 226-227 in clavis 1877; Botan. Jahrb. 2: 154. 1881; in Engler, Pflanzenreich 216: 128-129. 1903. Lourteig, Mem. N.Y. Bot. Gard. 9: 355, 358. 1957; Notas Museo La Plata 94: 281. 1959. Tipo; Venezuela, Amazonas, Ad flumen Orinoco, Río Cunucunuma, Spruce 3261 XII 1858 Holót. P. Isót. P.

Arbusto (h. 60 cm) de base leñosa. Raíces fibrosas, ramificadas. Rizoma leñoso (h. 1 cm diám.) horizontal. Tallos profusamente ramificados desde la base, ramificándose luego sucesivamente, cubiertos por el follaje. Pubescencia malpighiácea fina adpresa y setas finas, caducas (faltan en los tallos viejos). Internodios (10 - 15 mm) menores que las hojas imbricadas, subsésiles. Lámina elíptica o linear-elíptica (6 - 22 x 2 - 7 mm), pubescencia malpighiácea finísima, uniforme en ambas faces; l-nervada, las más anchas con un par de nervaduras secundarias sub-basales y 1 ó 2 pares ascendentes; base obtusa; ápice agudo u obtuso. Flores alternas en la parte superior de las ramas. Pedúnculos interpeciolares (1,5 - 3 mm). Bractéolas ovadas o elípticas, agudas, pubescentes, en el ápice de los pedúnculos.

Cáliz (5,5 - 7 mm) calcar redondeado; poco estrechado en la fauce, uniformemente pubescente y setoso sobre los nervios en la parte inferior; lóbulos anchos; apéndices intersépálicos cortos, pubescentes. Interiormente notablemente pubescente; detrás de los estambres lanoso. Pétalos blanquecinos espatulados, angostos ($\pm 3 \times 0,75 - 1,25$ mm). Estambres inclusos, los 2 dorsales cortísimos, los episépalos poco más largos que los epipétalos, 3 de los primeros glabros, los otros laxamente pubescentes. Disco glandular suboblongo a obovoideo, subascendente. Ovario semiovoideo, glabro o algunos pelos en el ápice. Estilo glabro o con pocos pelos. Ovulos 6 - 7.

Semillas pardas, suborbiculares o subovoideas, aplanadas ($\pm 1,25$ mm largo), finamente foveoladas.

Nombre vernáculo: Te-ju-jo-ka-nó.

Distribución geográfica. Endémica de la región de Atabapo en Amazonas venezolana.

Material estudiado. VENEZUELA. Amazonas. Orinoco, Prope Esmeralda, Spruce 3261 XII 1858 P. Río Orinoco, Cunucunuma, Fariña, Velázquez y Medina 462 I-II 1969 NY. Río Cunucunuma, Culebra rapids, N of base of Cerro Duida, 200 m, Maguire, Cowan and Wurdack 30348 23 XII 1950 NY, P. Atabapo, Río Cunucunuma entre Culebra y Huachamacari, 180-210 m, Steyermark et al. 125678 28 I- 8 II 1982 P, VEN. Atabapo, Cerro Yureba, lower Ventuari, Salto Yureba, 350 m, Liesner 18650 14 III 1985 MO, P. Río Cunucunuma, near Culebra, 210 m, Liesner 17524 15-16 II 1985 MO, P.

* Nombrada así porque vive en los saltos de agua de los ríos.

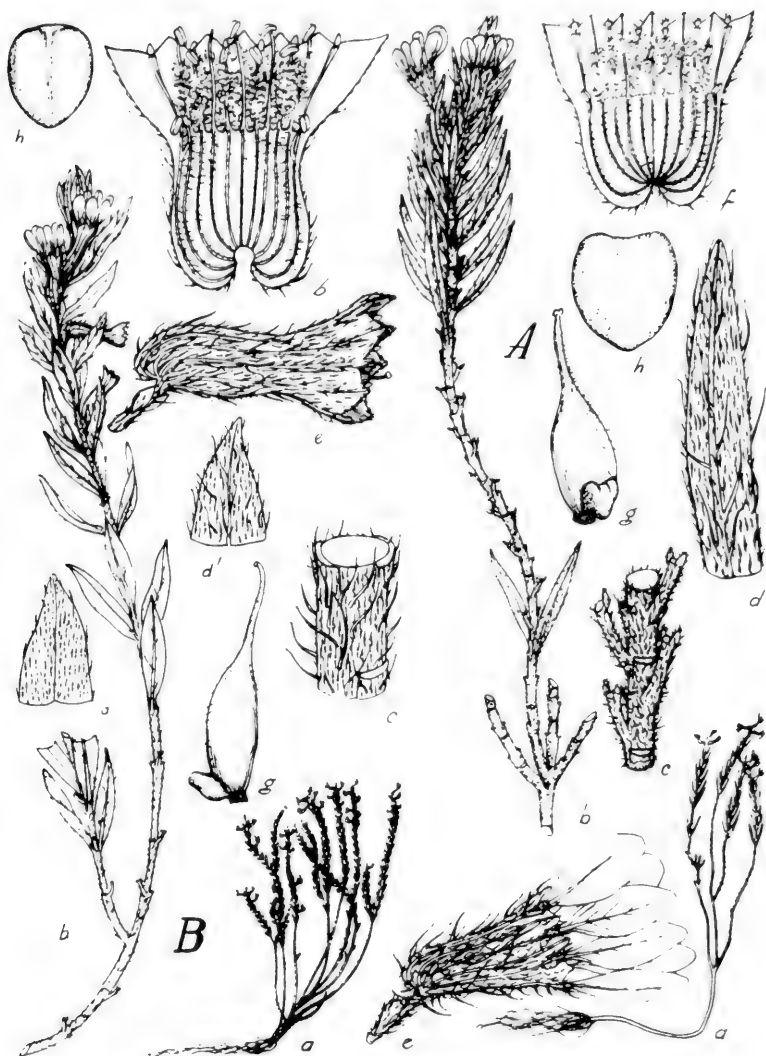


Fig.2. A, *C. distichophylla*: a, planta $\times \frac{1}{4}$; b, ramo $\times 2$; c, tallo $\times 5$; d, hoja $\times 10$; e, flor $\times 6$; f, interior $\times 6$; g, pistilo y disco $\times 12$; h, semilla $\times 8$. B, *C. cataractarum*: a, planta $\times \frac{1}{8}$; b, ramo $\times 2$; c, tallo $\times 12$; d, d', haz, envés foliar $\times 8$; e, cáliz $\times 6$; f, interior $\times 6$; g, pistilo y disco $\times 6$; h, semilla $\times 12$. J. Pérez Román del.

10. *Cuphea distichophylla** Lourt.

Fig. 2A

Lourteig, Mem. N.Y.Bot.Gard. 9(3): 357-358, fig. 68. 1957; Notas Mus. La Plata 94: 281. 1959. Tipo: Venezuela, Amazonas, North savanna, Cerro Sipapó (Paraqué), 1400 m, B. Maguire & L. Politi 27765 17 XII 1948 NY.

Subarbusto h. 30 cm. Rizoma subleñoso. Raíces ramificadas, fibrosas. Tallo erguido o decumbente (4 mm diám. en la base), ramificado, malpighiáceo-pubescente, pelos simples, finos y setas largas purpúreas. Internodios 1 - 4 mm. Hojas muy aproximadas, en apariencia dística, decusadas, ascendentes, rígidas, subsésiles. Pecíolo corto, grueso, purpúreo, pubescente. Lámina discolor, lanceolada a lanceolado-linear (10 - 18 x 1,5 - 3 mm), aguda, nervio central ancho, notable en el envés; pubescencia malpighiácea corta, uniforme en ambas faces, más densa en el envés, pelos con ramas hirsutas; margen recurvado. Flores en el ápice de los ramos, pocas. Pedúnculos (\pm 2 mm) interpeciolares, purpúreos, pubescentes como las ramas. Bractéolas en el ápice del pedúnculo ovadas, malpighiáceo- y glanduloso-pubescentes.

Cáliz (4,5 - 5 mm) purpúreo, calcar obtuso, canoso-malpighiáceo-pubescente y con setas purpúreas; lóbulos agudos; apéndices intersepálicos por lo común setosos, más pequeños que los lóbulos. Interiormente pubescente sobre los nervios y lanoso detrás de los estambres. Pétalos purpúreos, obovados a oblongos, espatulados (3,5 - 5 x 2-3mm), nervio central con pelos blancos, en la base del dorso. Estambres inclusos, los episépalos llegan casi al borde del cáliz, los 3 ventrales son glabros, los otros lanoso-pubescentes. Disco muy grueso, subhorizontal o subsacendente (\pm 0,6 mm), apenas lobulado. Ovario semiovoideo asimétrico, pequeño (\pm 1 mm), pubescente. Estilo grueso, incluso (1-1,25 mm), pubescente. Estigma subcapitado. Ovulos 2 - 3.

Semilla parda, suborbicular (1,5 - 1,6 cm), apenas marginada, finamente foveolada.

Distribución geográfica. Endémica del Cerro Sipapó en Amazonas venezolana.

Material estudiado. VENEZUELA. Amazonas. Cerro Sipapó (Paraqué), 1400 m, B. Maguire & L. Politi 27765 17 XII 1948 NY. Ib., savanna on SE slopes of Peak I, 1700 - 1900 m, leg. Maguire & Politi 27646 12 XII 1948 NY, P.

11. *Cuphea Blackii** Lourt.

Lourteig, Sellowia 16: 137 - 139, fig. 3, lám. 3. 1964. Tipo: Brasil, Amapá, Oiapoque, beira de estrada, que vai para o campo de aviação, Black 49-8243 30 IX 1949 Holót. P. Isót. IAN:

* El nombre, derivado del griego, recuerda la aparente disposición de las hojas.

* Dedicada a George Alexander Black (1916-1957) botánico americano quien herborizó en la región amazónica y recogió el tipo.

Subarbusto h. 1 m, o herbácea, toda malpighiáceo-pubescente. Raíces fibrosas ramificadas. Tallo procumbente, base subleñosa, ramificado desde la base y luego sucesivamente. A veces en ramos jóvenes, además de la pubescencia malpighiácea, hay dos hileras de pelos glandulares muy finos. Internodios de longitud variada, mayores o menores que las hojas. Hojas decusadas o a veces en verticilos de 3, subsésiles. Pecíolos 0,5 - 1 mm. Lámina linear, oblongo-lanceola a elíptica (13 - 30 x 2 - 15 mm), ambas faces malpighiáceo-pubescentes, nervio medio prominente y dos o 3 pares de nervios secundarios rojizos, visibles sobre el envés; base obtusa o aguda; ápice agudo. Flores solitarias, a veces dispuestas en "racimos" (h. 13 cm) en el ápice de los ramos acompañadas de hipsófilas decusadas, ovadas (0,50 - 1 x 0,25 - 0,50 mm), alternas o decusadas. Pedúnculo interpeciolar (0,75 - 1 mm), densamente pubescente. Bractéolas ± en la mitad del pedúnculo, lineares, agudas, ocultas por la pubescencia densa.

Cáliz (2,5 - 5 mm) rosado-purpúreo, densamente malpighiáceo-pubescente; calcar obtuso, en forma de ampolla en el fruto; lóbulos anchos, agudos; apéndices intersepálicos del mismo largo, pubescentes, los 2 dorsales con setas muy largas. Interiormente glabro, lanoso detrás de los estambres. Estambres inclusos insertos cerca de la mitad del tubo del cáliz; filamentos lanosos. Disco subhorizontal, pequeño. Ovario glabro. Estilo inclusivo, glabro. Estigma capitado. Ovulos generalmente 4.

Semilla parda, elipsoidal (1,25 - 1,75 mm), marginada, finamente foveolada.

Distribución geográfica. Vive en la región del Oyapok, sobre afloramientos graníticos, rocas y en sabanas, sobre ambos márgenes del río, en Guayana Francesa y en Brasil.

Material estudiado. GUAYANA FRANCESA. Vallée du Rio de Sikini, Roche Sikini, 50 m, Aubert de la Rüe 16 III 1949 P. Bas Oyapock, Saut Maripa, J.J. de Granville 2690 13 VII 1976 CAY, P. Monte de la Trinité, 400 m de Granville 4754 5 VIII 1981 CAY, P. Oyapock, Saut Armontabo, Oldeman 312 5 VII 1967 CAY, P. Aéroport St. Georges, Oldeman et Sastre 316 21 XI 1968 CAY, P. Ib., Sastre 4758 12 IV 1976 P. Fleuve Approuague, Rivière Arataye, Saut Pararé, Sastre 5805 29 VIII 1977 P.

BRASIL. Amazonas. Región Uiaoque, Campo de aviação, Black 49-8823 3 X 1949 IAN, P. Ib., airfield, 9 Km NE of Oiaoque, H. Irwin & L.T. Westra 47244 30 VII 1960 IAN, NY, P. Cachoeira Cachari, W mouth of Cricu River, Pires 47534 14 VIII 1960 IAN, NY, P. Near Mt. Carupina, Pires & Westra 48869 16 X 1960 IAN, NY, P. Oiaoque, Froes 25941 10 II 1950 IAN. Campo de aviação, Black 49-8315 3 X 1949. Ib., Egler 1435 25 IV 1960 HB, NY.

12. *Cuphea rigidula**Bentham

Bentham, J. Bot. 2: 316. 1840. Koehne in Martius, Fl. Brasil. 13(2):223. 1877; Bot. Jahrb. 1: 456. 1881; in Engler, Pflanzenreich 216: 111. 1903. Lourteig, Sellowia 16: 126, fig. 1A. 1964. Non *C. rigidula* Seemann.
Tipo: Guiana Británica, Schomburgk 155 a. 1840 Holst. K.

Hierba o subarbolito h. 30 cm. Pubescencia adpreso-malpighiácea fina, pelos iso- o anisobraquiados y setas blancas y violáceas muy largas (h. 2,5 mm) abundantes. Tallo muy ramificado, pubescente y densamente setoso. Hojas decusadas. Internodios de longitud variable. Pecíolo (1-1,5 mm) pubescente como el tallo. Lámina elíptica a lanceolada, decurrente en el pecíolo (15 - 60 x 8 - 12 mm), aguda, haz poco malpighiáceo-pubescente y setas abundantes; envés malpighiáceo-pubescente y setas sobre las nervaduras; largamente ciliada. Cimas de "racimos" de flores alternas interpeciolares acompañadas de hipsófilas oblongas o elípticas, agudas (2 - 5 x 1 - 2 mm), poco pubescentes hasta glabras, setoso-ciliadas. Pedúnculos (1 - 1,5 mm) pubescentes como el tallo. Bractéolas oblongo-elípticas, agudas (1 - 1,5 mm) glabras, más arriba de la mitad del pedúnculo.

Cáliz (4 - 6 mm) enangostado en la fauce luego ampliado; lóbulos anchos, agudos, los dorsales mayores; apéndices subulados menores que los lóbulos, setosos o no; malpighiáceo-pubescente y setoso. Interiormente tubo finamente piloso sobre los nervios o sólo sobre los dorsales, poco lanoso detrás de los estambres. Pétalos rosados, obovado-subespatulados, los 2 dorsales violáceos (?). Estambres insertos en el $\frac{1}{2}$ superior del cáliz, los episépalos ventrales glabros, los otros retrorso-hirsuto-pilosos en la parte inferior. Disco glandular violáceo, oblongo, horizontal-subascendente. Ovario semiovoideo, incluso, piloso en el dorso y en el ápice, Estilo densamente piloso. Estigma capitado. Ovulos 9-10.

Semilla parda suborbicular, aplanada (1 - 1,25 mm), levemente marginada, finamente foveolada.

Distribución geográfica. Hallada una vez en Guiana y otra en Venezuela.

Material estudiado. VENEZUELA. Bolívar. Alto Caura, al pie del Salto Maraveni, 680 m, F. Cardona 3013 IV 1965 P, VEN.

GUIANA. S. 1., Schomburgk 155 a. 1840 K.

OBS. Esta especie fué incluida por Koehne en la Sección *Heteranthus*. Sus caracteres corresponden a los de la Sección *Amazoniana*.

13. *Cuphea dactylophora**Koehne

Fig. 1 B

Koehne in Martius, Fl. Brasil. 13 (2): 226. 1877; Bot. Jahrb. 2: 154. 1881; in Engler, Pflanzenreich 216: 128. 1903. Lourteig, Notas Mus. La Plata 94: 280. 1959. Tipo: Guiana Británica, Schomburgk 1556 a. 1840 Holst. K.

*Así llamada por la consistencia de sus ramas.

*El epíteto derivado del griego (= forma de dedo) alude a la forma del disco.

Subarbusto densamente malpighiáceo-pubescente, pelos aniso-braquiados. Raíces fibrosas muy ramificadas. Rizoma (h. 20 x 0,5 cm diám.), radicante. Tallo prostrado, procumbente, subleñoso en la base, a veces tortuoso, profusamente ramificado; densamente malpighiáceo-adpreso-pubescente. Internodios 5 - 30 mm, excepcionalmente mayores que las hojas. Hojas comúnmente subsésiles. Pecíolos grueso (0,5 - 40 mm). Lámina lineal a lanceolada, muy raro elíptica (10 - 45 x 1 - 8 mm), decurrente en el pecíolo; base aguda; ápice agudo, raro obtuso; nervio medio rojizo visible sobre ambas faces y 2-4 pares de nervios secundarios ascendentes visibles sobre el envés; pubescencia malpighiácea, adpresa, densa, a veces menos en el envés. Flores alternas en los ápices de las ramas (excepcionalmente acompañadas de hipsófilas, espécimen de Brasil). Pedúnculos interpeciolares 1 - 4 mm. Bractéolas suborbiculares a oblongas (0,2 - 1 mm), glabras o pubescentes.

Cáliz (5 - 7 mm) enangostado en la base y luego ampliamente dilatado, calcar obtuso, corto, lóbulos triangulares, agudos; apéndices intersepálicos menores, densamente malpighiáceo-pubescente. Interiormente todo piloso, detrás de los estambres lanoso. Pétalos rosado-violáceo, orbiculares u obovados, espatulados, los dorsales menores. Disco glandular cilíndrico, erecto. Estambres dorsales muy cortos, los otros dos ciclos a veces poco desiguales, todos pilosos. Ovario fusiforme (\pm 2 mm), piloso o sólo en el ápice. Estilo inclusivo, piloso. Estigma capitado. Ovulos 3.

Semilla parda, suborbicular, aplanada (\pm 1 mm), finamente foveolada, apenas marginada,

Distribución geográfica. Especie abundante en las savanas altas y tepuís de Venezuela; hallada una vez en territorio brasileño en la frontera venezolana y el tipo en Guayana.

Material estudiado. VENEZUELA. Bolívar. Carretera El Dorado, Km 109, Aristeguieta y Medina 3727 XI 1958 P, VEN. Ib., Santa Elena de Uarén, Salto El Danto, L. Marcano Berti y J. Bautista 2496 13 XII 1969 MER, P. 120 Km S El Dorado to Santa Elena, Paso de Danto, 1200 m, Steyermark 111270 29 XII 1974 P, VEN. Faldas del Paujil, 105 Km S de El Dorado, Bernardi 6802 26 IV 1957 NY. Raudal Tukaika, Caroni 430 m, Cardona 1731 3 X 1940 NY. Alto Río Cuyuni, 10 - 15 Km del Cerro Escalera, Río Uiría-Yuk, 300 ft., B. & C. Maguire & Steyermark 46815 20 VIII 1962 NY, P. Drenaje Río Cuyuni, S of El Dorado, 1300-1380 m, Steyermark y G. y E. Dunsterville 104483 22-28 XII 1970 P, VEN. Paso de la Virgen, Km 95-Km 117, S of El Dorado to Santa Elena, 1200 m, Steyermark 111256 29 XII 1975 P, VEN. Distr. Roscio, Gran Sabana, Parupa, 1250 m O. Huber et al. 7219 2 III 1983 MYF, P. Gran Sabana, Río Aponwao, hacia Salto Aponwao, 1200 m, Huber y Entralgo 7398 7 III 1983 MYF, P. Distr. Roscio, entre San Rafael y Río Kamuirán, 1100-1200 m, L. Ruiz Terán y S. López Palacios 11289 15 VII 1974 MERF, P. Cerro La Danta, NW Cerro La Danta, NW Cerro Venamo, 1040-1060 m, Steyermark & S. Nilsson 10 13 IV 1960 NY, P, VEN. Cerro Venamo (ca. límite Guayana Inglesa), SW, ca. Salto Venamo, 1220- 1275 m, Steyermark & G. and E. Dunsterville

92831 6-7 I 1964 P, VEN. Cerro Uanampan, S of Uei-tepui, betw. Luepa & Cerro Venamo, 1330-1450 m, Steyermark & Nilsson 756 25 IV 1960 P, VEN. Valley Río Uarama, betw. Uarama-tepui, NE of Luepa, 1220 m, Steyermark & Nilsson 634 24-25 IV 1960 NY, P, VEN. Gran Sabana, 42,5 Km NE Misión Santa Teresita de Karauayán, 1130 m, Steyermark et al. 115609 22 V 1978 P, VEN. Gran Sabana, Cabeceras del Río Aponguao, 1350-1400 m, Steyermark y G. y E. Dunsterville 104113 20 XII 1970 P, VEN. 136-140 Km S de El Dorado hacia Santa Elena, 1400-1500 m, B.K. Holst, Steyermark & Manara 2137 3 IV 1985 MQ, P. GUIANA.S.L., Schomburgk 1556 a. 1840 K.

14. *Cuphea curiosa*★ Lourt. sp. n.

Fig. 3

Fruticulus usque 35 cm altus. Rhizoma dense radicans; radices fibrosae ramificantibus (usque 15 cm). Caule ad basim sublignoso (0,5 cm diam.), ramosissimo, dense foliato, adpreso-malpighiaceo-pubescenti et setoso. Folia decussata approximata. Lamina lanceolato-elliptica (8 - 30 x 1 - 6 mm) in petiolum decurrens, acuta, pubescentia malpighiacea, tenui (raro supra glabra), 1 - 2 paribus nervorum secundarium. Inflorescentia usque 7 cm longa in apicem ramorum hypsophyllis 1-nervatis (3 - 5 x 1,4 - 2 mm) et floribus alternis interpetiolaribus composita. Pedicelo 1 - 1,5 mm longo. Bracteolae crassae ellipticae, glabrae (0,2 - 0,5 mm).

Calyx violaceus (3 - 3,5 mm), calcar obtuso, nervis prominentibus, appendicibus intersepalicis subulatis. Intus secus nerviis pilosus et lanoso-pubescentis pone staminam. Petala roseo-violacea (dua dorsalia obscuriora, pilis albis ad basim nervis subtus obsita), oblongo-subspathulata (1,5 - 1,7 mm), dorsalia obovato-subspathulata (\pm 2 mm). Stamina inclusa, 3 ventralia episepala glabra, cetera pilosa. Discus rubro-purpureus, cylindricus (\pm 0,5 mm), erectus. Ovarii dorsum \pm pilosum. Stylus pilosus. Ovula 5 - 6.

Semina brunnea, suborbicularia (\pm 1 mm), plano-convexa, tenuissime foveolata.

Typus: Venezuela, Est. Bolívar, selva de galería y sabana a lo largo del Río Kanarakuni, N y NW de la Misión de Campamento de Sanidad del río Kanarakuni, 400 m, Steyermark 97835 17 - 29 III 1967 Holst. P, Isót. VEN.

Subarbusto (h. 35 cm) finisimamente adpreso-malpighiáceo-pubescente (pelos de ramas desiguales) y setoso. Rizoma \pm grueso con numerosas raíces fibrosas, ramificadas (h. 15 cm). Tallo sublenoso en la base (h. 0,5 cm diám.), profusamente ramificado y densamente foliado, malpighiáceo y setoso-pubescente. Internodios 7 mm. Hojas decusadas, aproximadas sobre todo en los ápices, Lámina lanceolada a elíptica (8 - 30 x 1 - 6 mm) decurrente en el pecíolo, aguda, finamente malpighiáceo-pubescente, pelos ordenados longitudinalmente (raro haz glabro), rarísimo algunas setas, 3-nervada, generalmente 2(ó 1) pares de nervaduras secundarias;

★ Así llamada porque presenta caracteres de otras especies que hacían difícil su interpretación.

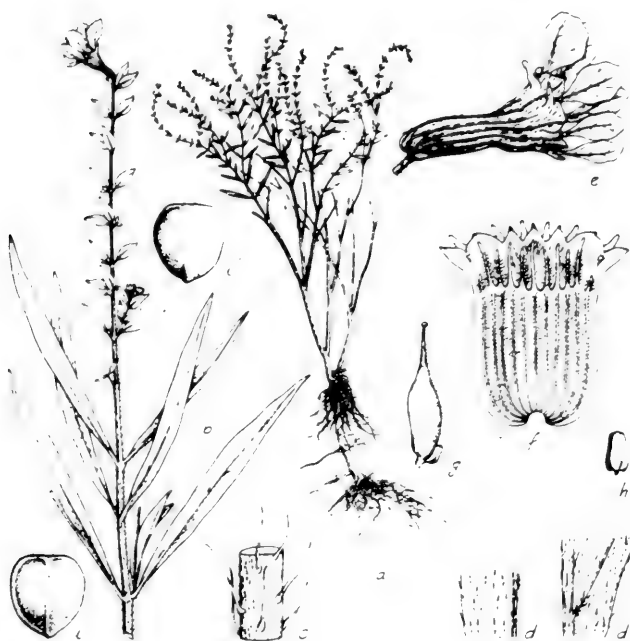


Fig. 3. *C. curiosa*: a, planta $\times 1/6$; b, ramo $\times 1,5$; c, tallo $\times 10$; d; d, haz y envés foliar $\times 10$; e, flor $\times 10$; f, interior $\times 10$; g, pistilo y disco $\times 10$; h, disco $\times 20$; i, i', semilla, ventral y dorsal. $\times 15$. H. Tang del.

bordes algo recurvados. Inflorescencias (h. 7 cm) en los ramos superiores con hipsófilas 1-nervadas (3 - 5 \times 1,5 - 2 mm), flores alternas interpeciulares. Pedúnculos 1 - 1,5 mm. Bractéolas gruesas, elípticas, glabras (0,2 - 0,5 mm).

Cáliz violáceo (3 - 3,5 mm) delgado, calcarado, ensanchado en la fauce, lóbulos dorsal mayor, nervios prominentes; uniformemente malpighiáceo-pubescente, rarísimo alguna seta; apéndices intersépálicos subulados, iguales o mayores que los lóbulos, pubescentes. Interiormente nervios pilosos, lanceo detrás de los estambres. Pétalos rosado-violáceos (los dos dorsales más oscuros), oblongo-subespatulados (1,5 - 1,75 mm), los dos dorsales obovado-subespatulados (\pm 2 mm). Estambres inclusos, los 3 episépalos ventrales glabros, los otros pilosos. Disco glandularrojizo-purpúreo, grueso, cilíndrico, erecto (\pm 0,5 mm). Ovario oblongo-asimétrico, dorso \pm piloso. Estilo inclusivo, piloso. Estigma pequeño, subcapitado. Óvulos 5 - 6.

Semillas pardas, suborbiculares (\pm 1 mm), plano-convexas, finisimamente foveoladas.

Distribución geográfica. Especie venezolana que habita lugares muy mojados, de aguas corrientes, sobre bancos y rocas, en selvas de galería y vírgenes, entre 100 y 400 m de altitud.

Material estudiado. VENEZUELA. Est. Bolívar. Río Kanarakuni, N y NW de la misión de Campamento de Sanidad del Río Kanarakuni, 400 m, Steyermark 97835 17-29 III 1967 P, VEN. Río Nichare (afl. del Caura) arriba de la desembocadura del Cicuta, 200 - 250 m, Steyermark y Gibson 95670 25 IV 1960 K, NY, P, VEN. Río Diamante Negro, tributary of Río Guaña, 300 m, Steyermark et al. 107107 27 IV 1973 P, VEN. Río Parguaza, betw. El Carmen and Raudal Maraca, 50 - 100 Km from river mouth, 110-115 m, Wurdack & Monachino 41073 1 I 1950 NY, P. Amazonas. Río Siapa, betw. Raudal Gallineta and Salto Gallineta, 130-150 m, Wurdack & Adderley 43590 23 VI 1959 NY, P.

Esta especie es vecina de C. pleiantha y C. dactylophora. Difiere de ambas en la forma y tamaño del cáliz, los pétalos y las bractéolas. La pubescencia, forma y nerviación de las hojas la distinguen de la primera. Las inflorescencias, setas del cáliz y el disco la separan de C. cataractarum.

OBS. La colección Wurdack & Monachino 41073, muy abundante, fué revisada en su integridad gracias al préstamo total de N.Y. Bot. Garden. No presenta los tallos leñosos como los otros especímenes citados. Tampoco hay setas en sus tallos, salvo por alguna aislada en pocos tallos y en una proporción mínima. Todos los otros caracteres son de C. curiosa. No se puede saber por el momento si es una forma ecológica o si se trata de un taxón en evolución, por aislamiento, dada la gran distancia que separa esta colección de las otras típicas.

Por otra parte, la colección Wurdack y Adderley 43590, muy pequeña del Río Siapa, muy alejada también de las localidades típicas, presenta los tallos setosos como aquéllas y todos los caracteres de la especie. Deja suponer que el área de la especie ha sido mayor que la que podemos establecer actualmente.

15. *Cuphea pleiantha** Lourt.

Fig. 4 B

Lourteig, Mem. N.Y. Bot. Gard. 9 (3): 356-357, fig. 67. 1957; Notas Mus. La Plata 94: 280. 1959. Tipo. Venezuela, Amazonas, Serranía Yutajé, Río Manapiare, right branch of Caño Yutajé, 1300 m, B. & C.K. Maguire 35216 9 II 1953 NY.

Arbusto h. 50 cm, poco malpighiáceo-pubescente; pelos adpresos, blancos, anisobraquiados. Raíces fibrosas. Rizoma subleñoso (ca. 1 cm diám.). Tallo subleñoso (h. 1 cm. diám.) ramificado sucesivamente en ramas abundantes, ascendentes, rojizas, malpighiáceo-pubescentes. Internodios (3 - 6 mm) menores que las hojas. Hojas sésiles, muy aproximadas. Lámina lanceolada a linear (12 - 40 x 1 - 6 mm), subaguda, haz

★ El epíteto, derivado del griego, alude a la abundancia de flores en las inflorescencias.

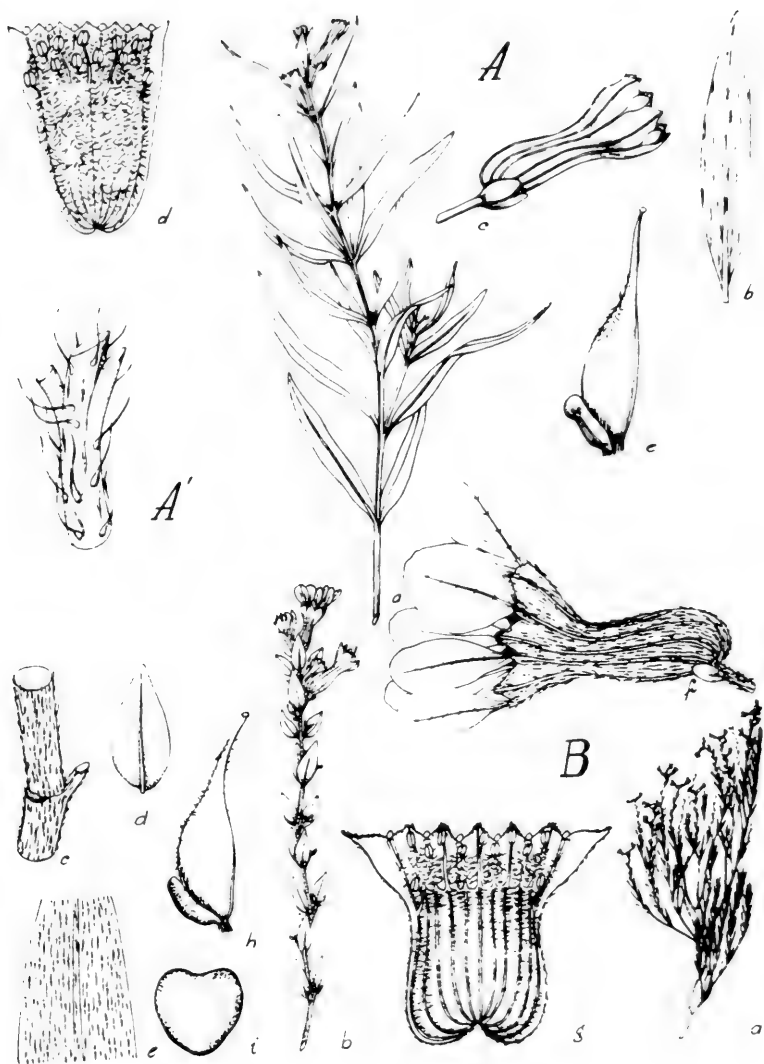


Fig. 4. C. rhodocalyx: a, rama x 2; b, envés foliar x3; c, flor sin corola x 6; interior x 6; e, pistilo y disco x 12. A', C. Cardonae: tallo x 2,5. B, C. pleiantha: a, planta x 1/8; b, rama x 2; c, tallo x 5; d, hoja x 10; f, flor x 6; g, interior x 6; h, pistilo y disco x 12. J. Pérez Román del.

glabro, envés levemente malpighiáceo-pubescente; nervio central rojo visible sobre ambas faces; margen recurvado. Flores alternas en "racimos" (± 7 cm) acompañadas de hipsófilas ovado-lanceoladas, oblongas ($2 - 5 \times 2$ mm). Pedúnculos ($1 - 3$ mm) gruesos, interpeciolares, glabros o subglabros. Bractéolas cerca del ápice del pedúnculo, gruesas rojizas, oblongas u ovadas ($0,5 - 0,6$ mm), agudas, glabras.

Cáliz ($5,5 - 6$ mm) purpúreo, muy pocos pelos finísimos, malpighiáceos; ampliado en la fauce; calcar poco notable, obtuso; lóbulos agudos; apéndices menores que los lóbulos finamente ciliados. Interiormente pubescente sobre los nervios, lanoso detrás de los estambres. Pétalos dorsales violáceos o purpúreos con pelos blancos en la base del dorso del nervio, los ventrales blancos o apenas rosados, obovado u oblongo-espatulados. Estambres episépalos ventrales glabros, los otros lanosos. Disco glandular grueso, grande ($1,25$ mm largo), erecto, cilíndrico. Ovario semiovoideo asimétrico, finamente pubescente. Estilo pubescente. Estigma subcapitado. Ovulos $7 - 9$.

Semilla (inmatura) parda, suborbicular, aplanada, levemente marginada, finísimamente foveolada.

Distribución geográfica. Endémica de Amazonas venezolana, región del Yutajé.

Material estudiado. VENEZUELA. Amazonas. Serranía Yutajé, Río Manapiare, Caño Yutajé, 1300 m, B. & C. K. Maguire 35216 9 II 1953 NY. Yutajé, vic. La Chorrera, 150 m, Steyermark et al. 123626 8 XI 1960 P, VEN. Río Manapiare, 1300 m, B. & C. K. Maguire 35102 9 II 1953 NY, P, US. Ib., leg. B. & C. K. Maguire 25376 23 II 1953 NY, P.

OBS. La especie vive a 1300 m de altitud; el espécimen Steyermark recogido a 150 ha sido, sin duda, arrastrado por las aguas.

16. *Cuphea Cardonae** Lourt. stat. nov., nom. nov.
Fig. 4 A'

Cuphea rhodocalyx Lourt. var. setosa Lourteig, Sellowia 16: 136-137, lám. 2. 1964. Non *Cuphea setosa* Koehne. Tipo Venezuela, Bolívar, suelo rocoso del Río Pauo, afluente del Río Caura, 390 m, Cardona 2972 I 1963. Holót. P. Isót. VEN.

Arbusto h. 60 cm. Tallo leñoso, profusamente ramificado, ramas leñosas, setosas (setas violáceas, base muy engrosada) y adpreso-malpighiáceo-pubescente (eplos blancos, finos, anisobraquiados); ramos jóvenes subcuadrangulares, subalados. Follaje denso. Internodios ($2 - 5$ mm). Pecíolos (± 2 mm) dorsalmente pilosos. Lámina oblongo-elíptica ($5 - 12 \times 1 - 2$ mm), obtusa, $2-3$ pares de nervaduras secundarias, alternas, ascendentes, finas; pelos malpighiáceos esparcidos en el envés, haz glabro, marginada; base cuneada, decurrente en el pecíolo. Inflorescen-

* Dedicada al Señor Félix Cardona Puig, Capitán y naturalista venezolano bien conocido, quien hizo interesantes colecciones en la región y recogió el tipo.

cias cortas, con hipsófilas, flores alternas hacia los ápices de los ramos. Pedúnculos interpeciolares, pilosos. Bractéolas suborbiculares obtusas o agudas ($\pm 0,25$ mm) en la mitad superior del pedúnculo.

Cáliz recto, poco ensanchado en la fauce (4,5 - 5 mm), calcar obtuso; glabro o pocos pelos malpighiáceos adpresos, finos; lóbulos agudos, los 2 dorsales anchos; apéndices intersepálicos gruesos, verdoso-purpúreos, algo menores. Interiormente piloso, lanoso detrás de los estambres. Estambres hirsuto-pilosos en su mitad inferior. Disco glandular violáceo, cilíndrico, erecto. Ovario elipsoideo-asimétrico, dorsalmente hirsuto-piloso. Estilo con pocos pelos, exserto después de la antesis. Ovulos 5.

Semillas suborbiculares, aplanadas (± 1 mm), pardas, finamente foveoladas.

Distribución geográfica. Endémica de la guayana venezolana, vive entre rocas, en el río.

Material estudiado. VENEZUELA. Bolívar. Río Pauo, 390 m, Cardona 2972 I 1963 P, VEN.

Cercana a *Cuphea rhodocalyx* por sus flores, inflorescencias y pubescencia malpighiáceas. Difiere de ella por las bractéolas de \pm la mitad de su tamaño y no en la base del cáliz, por sus hojas con 2-3 pares de nervios secundarios y los tallos setosos. Estos caracteres la acercan a *Cuphea curiosa*.

Cuando describí *Cuphea rhodocalyx* var. setosa, sólo los tipos de ambas variedades existían y no podía evaluar el grado de variación de la especie. Recientemente obtuve otras colecciones que demuestran la constancia de los caracteres de *C. rhodocalyx*, aunque las plantas de mayor edad, sean más altas. En esta circunstancia, también me llegaron materiales de especies hasta ahora desconocidas, de la misma sección, que me permitieron una concepción completa, y algo distinta, del conjunto de estas especies vicariantes, por excelencia, en la región.

17. *Cuphea rhodocalyx*★ Lourt.

Fig. 4 A

Lourteig, Mem. N.Y. Bot. Gard. 9(3): 355-356, fig. 66. 1957; Notas Mus. La Plata 94: 280. 1959. Tipo: Venezuela, Amazonas, Cerro Marahuaca, along stream montane slopes, 1000 m, B. & B.Jr. Maguire 29201 9 V 1949 NY.

Herbácea (h. 60 cm) adpreso-malpighiáceo-pubescente, glabrescente. Rizoma corto, raíces delgadas, fibrosas, densamente ramificadas. Tallo procumbentes (base leñosa (h. 0,5 cm diám.) o erguidos, ramificados desde la base, pocos pelos malpighiáceos, adpresos blancos h. glabro. Internodios menores que las hojas (2-3 mm). Hojas subsésiles decurrentes sobre el tallo, dando a los tallos jóvenes un aspecto 4-alado. Lámina linear-lanceolada (5 - 10 x 1 - 3 mm), aguda, nervadura central vi-

★ Así llamada por el color rojo del cáliz.

sible en ambas faces, margen recurvado; glabra o pelos malpighiáceos esparcidos sobre el envés. Flores alternas en los ápices de los ramos, entre hojas, o en inflorescencias, "racimos" con hipsófilas. Pedúnculo ($\pm 0,5$ mm). Bractéolas ca del ápice del pedúnculo, grandes gruesas, oblongas u ovadas, agudas ($\pm 0,5$ mm).

Cáliz rosado-violáceo (2,5 - 4 mm), en forma de ampolla en el fruto; dilatado en la fauce; calcar poco notable, obtuso; lóbulos pequeños apéndices intersepálicos obtusos, gruesos, menores que los lóbulos; glabro o con poquísimos pelos malpighiáceos. Interiormente densamente piloso, más detrás de los estambres. Pétalos violáceos, obovado- u oblongo-espatulados, los dorsales algo menores. Estambres inclusos, los 3 ventrales apisépalos glabros, los otros pilosos. Disco glandular grueso (ca. 0,6 mm), subulado, obtuso, erecto. Ovario semiovoideo (1,5 mm), pubescente hacia el ápice. Estilo glabro ($\pm 0,5$ mm). Estigma capitado. Ovu- los 4 - 8.

Semilla parda ($\pm 1,5$ mm), subobovoideo-aplanada, base aguda, levemente marginada, finamente foveolada.

Distribución geográfica. Endémica de los Cerros de Atabapo, aislada de Cuphea cataractarum que vive en la zona baja.

Material estudiado. VENEZUELA. Amazonas. Dep. Atabapo. Cerro de Marahuaca, Río Yameduaka, 1225 m, R.L. Liesner 17617 17-18 II 1985 MO, P. Atabapo, bel. Salto Los Monos, Río Iguapo, 1500-1600 m, Liesner 18510 11 III 1985 MO, P. Atabapo, Cerro Marahuaca, Caño Negro, "Sima Camp", 1140 m, Steyermark and B. Holst 130645 21-22, 24 II 1985 MO, P. Cerro Marahuaca, 1000 m, B. & B.Jr. Maguire 29201 9 V 1949 NY.

Sección Pseudocircaea * (Koehne) Koehne

Koehne, Bot. Jahrb. 1: 442-443. 1881; 2: 168-169. 1882; in Engler, Pflanzenreich 216: 85, 147. 1903.

Subsectio Pseudocircaea Koehne in Martius, Fl. Brasil. 13(2): 219, 294-295. 1877 excl. ser. 1. Lectótipo: Cuphea impatientifolia Saint Hilairé

Disco glandular grueso horizontal a ascendente, cóncavo superiormente, dorso carenado. Pétalos blancos a violáceos, dorso del nervio medio piloso, raro glabro, persistentes doblándose dentro del cáliz después de la antesis; los 2 dorsales generalmente algo más anchos y menos largos que los 4 ventrales.

Hierbas, subarbutusto o arbustos, pubescentes y glandulosos.

Distribución geográfica. Endémica de Sudamérica, excluyendo las regiones guayanesa, amazónica y la Cordillera de los Andes. Sólo 5 especies conocidas de las cuales una, descrita por primera vez en este trabajo, presenta una semilla muy distinta a las demás, aunque por los otros caracteres pertenece a esta Sección.

* Así denominada por su falsa apariencia de Circaea (Onagrácea).

Clave de las especies

A. Pubescencia cistolítica, glandulífera y setosa

- a. Disco glandular semicupuliforme. Plantas viscosísimas3. *lutescens*
- a': Disco glandular horizontal a ascendente. Plantas ± setosas y glandulíferas.
 - b. Cáliz y tallos con setas larguísimas (rarísimo sin).....4. *persistens*
 - b': Cáliz con setas mezcladas a pelos cistolíticos y glandulíferos, poco más largas que ellos
 - c. Hierbas poco ramificadas. Hojas con pelos muy finos y cortos y setas finas esparcidas en el haz; envés con sólo setas sobre las nervaduras.....1. *impatentifolia*
 - c'. Arbusto profusamente ramificado. Hojas densamente cistolítico-glanduloso- y setoso-pubescentes en ambas faces.....2. *sessiliflora*

A': Pubescencia malpighiácea tenuísima.....5. *Scolnikiae*1. *Cuphea impatientifolia*★ St. Hilaire

Saint Hilaire, Fl. Brasil. Merid. 3: 113. 1833. Koehne in Martius, Fl. Brasil. 13(2): 296-297, lám. 54, 3. 1877; Bot. Jahrb. 2: 169. 1882; 3: 129. 1882; 4: 401. 1883; in Engler, Pflanzenreich 216: 149. 1903. Tipo: Brasil, Minas Geraes, Près village Contendas, sertão, A. Nogueira Duarte 39, in herb. St. Hilaire, Voyage 1816-21. Holót. P. Isót. P.

Cuphea prunellifolia auct. (Koehne, Bot. Jahrb. 3: 129; 4: 401, 403; l.c. 149 excl. St. Hil., 1903; Lourteig, Sellowia 17: 85-86. 1965). Non St. Hilaire⁽¹⁾.

C. circaeoides Koehne in Martius, l.c. 229, 295-296, lám. 54, 2; Bot. Jahrb. 2: 169. Non Smith.

C. affinitatum Koehne, Bot. Jahrb. 23. Beibl. 57: 20. 1897; Pflanzenreich 216: 120-121. 1903. Tipo: Brasil, Piahy, dry open places between Boa Esperança and Santa Ana das Minas, Gardner 2166 III 1839 Holót. K.

★ El epíteto alude a las hojas que recuerdan las de *Impatiens*.

(1) El tipo de *C. prunellifolia* St. Hil. Fl. Bras. Mer. 3: 108. 1833, es de Brasil: "assez commun près Rio de Janeiro sur le bord des fossés, et dans les lieux cultivés" St. Hilaire 468 Voy. 1816-21 Holót. P. Isót. P. Ese habitat no corresponde al de la especie así llamada por otros autores. Se trata de un espécimen de *C. carthagenensis* (Jacq.) Macbride, lo que ya sospechaba el autor al compararla con *C. Balsamona* Cham. et Schlecht., sinónimo de la especie de Jacquin.

Herbácea (h. 45 cm). Tallo erguido único o poco ramificado. Pubescencia fina, curva, pelos glandulosos cortísimos y setas finas (a veces faltan). Internodios h. 10 cm. Hojas decusadas, los pares en las ramas floríferas, muy desiguales, hasta una hoja bracteiforme (reducida h. 2 mm), enangostada, linear, aguda. Pecíolos largos h. 25 mm. Lámina lanceolada, aguda (20 - 60 x 10 - 30 mm), base atenuada, decurrente en el pecíolo; pubescencia fina, uniforme, cortísima y setas finas, largas esparcidas en el haz; setas sobre los nervios en el envés; nervaduras secundarias 8 - 10 pares, visibles en el envés. Flores solitarias, alternas reunidas en un "racimo" terminal (10 - 12 cm) y cimas acortadas (h. 4 cm) axilares. Pedúnculo 0,5 - 3 mm, interpeciolar con un par de bractéolas ovadas, ciliadas (0,25 - 0,5 mm), cerca de la mitad.

Cáliz (4,5 - 7 mm) tubo delgado, calcar obtuso, corto; nervios \pm pelos finos, cortos y setas esparcidas; lóbulos dorsales más anchos; apéndices intersepálicos pequeños con una seta, en los 2 dorsales muy largas. Interiormente piloso sobre los 2 nervios dorsales, lanoso detrás de los estambres. Pétalos rosa a violáceos, los dorsales obovados, los otros oblongos, pilosos en el dorso del nervio medio. Estambres episépálicos subexsertos, los 3 centrales glabros, los otros lanosos. Ovario anchamente ovado, ápice piloso. Estilo piloso. Estigma pequeño. Disco glandular horizontal a subascendente, cóncavo, dorso carenado. Ovulos 5 - 8.

Semilla parda, suborbicular, aplanada (\pm 2,5 mm), marginada, carúncula notable no prominente, finamente foveolada (generalmente 3 - 6).

Distribución geográfica. Endémica del E de Brasil, en lugares húmedos, en selvas y terrenos bajos.

Material estudiado. BRASIL. Paráiba. Alagôa Grande, J. Coelho de Moraes 874 13 VI 1953 IAN, P. Piauí. Between Boa Esperança and Santa Ana das Minas, Gardner 2166 III 1839 K. Bahia. Baixa Verde, 10 Km de Barreiras, G.A. Black 54-17965 31 XII 1954 IAN, P. Jacobina Poços d'Areia, Blanchet 3895 P. Fazenda Baraúva, 5 Km Barreiras, Black 54-17867 27 XII 1954 IAN. Canela a 98 Km S Barreiras, Black 17890 28 XII 1954 IAN. Minas Geraes. Contendas, Nogueira Duarte 39 ex herb. St. Hilaire, 1816-21 P. Minas Geraes, Glaziou 19756 p.p. P. Entre In-ficionado et Caraça, Glaziou 12679 11 VII 1882 P.

2. *Cuphea sessiliflora*★ St. Hil.

Saint Hilaire, Fl. Brasil. Merid. 3: 110. 1833. Koehne in Martius, Fl. Brasil. 13(2): 230, 297-298, lám. 54, 4. 1877; Bot. Jahrb. 2:169.1882; in Engler, Pflanzenreich 216: 148-149. 1903. Tipo: Brasil, Minas Geraes, Près village de Contendas, dans le Sertão, A. Nogueira Duarte 15 ex herb. St. Hilaire, Voyage 1816-21 Holót. P. Isót. P.

C. viscosissima var. parietarioides St. Hilaire, l.c. 111. Tipo: Brasil, Minas Geraes, pâturages près le village Contendas, St. Hilaire 630 1816-21 Holót. P.

★ Así llamada por el pedúnculo corto de las flores en el tipo.

C. parietarioides (St. Hil.) Koehne, Bot. Jahrb. 2: 170. 1881; Pflanzenreich, l.c. 149.

C. petiolata Pohl ex Koehne in Martius, l.c. 230, 298-299, lám. 54, 5. Non *petiolata* (L.) Koehne, Bot. Jahrb. 2: 170. 1882. Tipo: Brasil, Minas Geraes, Rio Bocaiuva, Pohl 2418 Lectót. W.

C. costata Koehne in Martius, l.c. 230, 298, lám. 55, 1; Bot. Jahrb. 2: 169-170. 1881; Pflanzenreich, l.c. 150. Lourteig, Lilloa 9: 376-378, fig. 19. 1943; Darwiniana 8: 271. 1948. Lectótipo: Brasil, Minas Geraes, Lagoa Santa, Warming Holót. C. Isót. P.

C. Chodatiana Koehne in Pflanzenreich l.c. 147. 1903. Tipo: Paraguay, Cerros de Tobaty, Hassler 6138 IX 1900 Holót. G. Isót. G.

C. talaverensis Koehne, Repert. Sp. Nov. 8: 197-198. 1910. Tipo: Paraguay, Nördlichen Chaco: Puerto Talavera, Fiebrig 1286 IX 1906. Holót. G. Isót. S.

C. Rojasii Koehne, Repert. l.c. 198-199. Tipo: Paraguay, Sierra de Amambay, Campos bei Esperanza, T. Rojas (ex herb. Hassler 10756) II 1908. Holót. G. Isót. P.

C. chiquitensis Herzog, Meded. Rijks Herb. Leiden 27: 16. 1915. Tipo: Bolivia, Chiquitos, in Kamp von Santiago de Chiquitos, ca. 600 m, Herzog 510 V 1907 Holót. L.

C. trichopetala Rusby et Koehne, Mem. Torrey Bot. Club 6(1): 40. 1896. Koehne, Bot. Jahrb. 23. Beibl. 57: 25. 1897; Pflanzenreich, l.c. 147, 148, fig. 20 B. Tipo: Bolivia, Bolivian Plateau, M. Beng 1008 a. 1891. Holót. NY. Isót. P, US, WIS.

C. mesostemon Koehne f. *angustifolia* Chodat, Bull. Herb. Boissier 7. App. 1: 72. 1898. Tipo: Paraguay, Prope riv. Carapegua, Hassler 1219 18.. Holót. G.

C. hispida Pohl ex Koehne in Martius, l.c. 297; Bot. Jahrb. 2: 169. 1881. Nomen.

Subfruticosa (h. 75 cm). Tallos desnudos en la parte inferior, glabros, profusamente ramificados; ramas con pubescencia blanca fina, pelos glandulosos finos violáceos, hirsutos desiguales. Internodios de largo variado h. 6 cm y cortísimos hacia el ápice. Hojas decusadas, los pares de los ramos floríferos desiguales, una hoja bracteiforme (7,5 x 3 mm) asimétrica. Pecíolos (2 - 10 mm) pubescentes como el tallo, casi nulos en las hojas superiores. Lámina ovado-oblonga a lanceolada (10 - 50 x 5 - 20 mm), base redondeada, raro subcordada; pubescencia cistófica, densa, uniforme, ± pelos glandulosos mezclados, ± setas finas en el haz, esparcidas; pubescencia corta, fina sin o con pocas setas esparcidas en el envés; 5-12 nervaduras secundarias impresas en el haz, prominentes en el envés; margen certamente ciliado, cilias rígidas.

Flores alternas interpeciolares o cimas cortas axilares. Pedúnculo 1 - 1,5 mm, acrecido en el fruto h. 3 mm; 2 bractéolas cerca del ápice, ovadas (± 0,5 mm) glabras o ciliadas.

Cáliz (7- 9,5 mm), enangostado en la fauce y luego ampliado; cálcar corto; setas glandulosas finas, violáceas, hirsutas, a veces setas finas largas y / o pelos blancos cortos mezclados; lóbulos anchos mu -

cronados; apéndices intersepálicos subglobosos, muy pequeños, setosos. Pétalos rosados a lilas, oblongo- a sublinear- subespatulados, los 2 dorsales algo más cortos y más anchos. Estambres episépalos subexsertos, los 3 ventrales glabros, los otros pilosos. Ovario glabro, ovado. Estilo piloso, exserto. Disco grueso, ovoideo, subascendente, cóncavo, dorsalmente carenado. Ovulos (2)- 3 - 6.

Semilla parda, obovoideo- o suborbicular-aplanada (ca. 2,5 mm), marginada, finisimamente foveolada, carúncula notable, no prominente (generalmente 3 semillas).

Distribución geográfica. Especie chaqueña y de campos llegando a una altitud de alrededor de 1000 m.

Material estudiado. BRASIL. Goiás. Goiás, Gardner 3714... P. Mun. Alto Paraíso, Chapada dos Veadeiros, GO - 12, W. Anderson, R. Barneby, G. Hatschbach et al. 36346 20 II 1975 MBM, P. Ib., 37 Km N of Veadeiros, 1000 m, Irwin et al. 24358 14 III 1969 NY, P. 25 Km of Cabeceiras, 1000 m, Irwin et al. 10527 19 XI 1965 NY, P. 10 Km S of Cavalcante, 1000 m, Irwin et al. 23967 7 III 1969 NY, P. Serra Geral do Paraná, ca. 20 Km of São João da Aliança, 1000 m, Irwin et al. 32077 17 III 1971 NY, P. San Isidoro, Pohl 1579 W. Minas Geraes. Contendas, Saint Hilaire 650, 1816 - 21 P. Ib., Nogueira Duarte 15, ex herb. Saint Hilaire 1816-21. P. Mun. Gouveia, Rod. BR 259, 1200-1300 m, Hatschbach 27007 5 IX 1971 MBM, P. Mun. Jaboticatuba, Serra do Cipó, Hatschbach 29922 5 VIII 1972 MBM, P. Ib., Chapeu do Sol, 1060 m, E. Pereira 8884 15 III 1964 HB. Lagoa Santa, Warming C, P. Mun. Bocaiuva, Corrego Cachoeira, Hatschbach 40803 21 I 1978 MBM, P. Coração de Jesus, U.O. de Jesus 86 26 XII 1963 HB, P. Rio Bocaiuva, Pohl 2418, 5732 W. Bahia. Serra aeroporto, região de Barreiras, 14 Km do Portão, Black 55-18045 5 X 1955 IAN, P. 5 Km S of Cocos, 530 m, Anderson et al. 37092 17 III 1972 NY, P. 20 Km N of Correntina to Inhaúmas, Harley 21913 28 IV 1980 K, P. Mato Grosso. Corumbá, baja de Tamego, C.A. Conceição 1239 3 III 1983 IBGE, P. Corumbá, Serra do Urucumf, Hatschbach 29531 15 IV 1972 MBM, P. Mun. Rio Brilhante, Casa Branca, Hatschbach 23615 15 II 1970 MBM, P. Rio Brilhante, Hatschbach 22150 12 VII 1969 MBM, P. Mun. Anastasio, Palmeiras, Hatschbach 23733 17 II 1970 MBM, P. Mun. Aquidauana, Piraputanga, Hatschbach 24582 11 VIII 1970 MBM, P. BOLIVIA. Bolivian Plateau, M. Bang 1008, a. 1891 NY, P, US, WIS. Tarija. Prov. Cercado, Tal Santa Ana, 2250 -2300 m, Gerold 67 30 I 1982 LPB, P. Dep. Santa Cruz, Prov. Chiquitos, Santiago de Chiquitos, ca. 600 m, Herzog 510 V 1907 L. Ib., Krapovickas 9230 5 II 1958; Ib., Krapovickas 9441 13 II 1958 LIL. Cochabamba. Morochata, 3400 m, Cárdenas 3446 III 1944 GH. PARAGUAY. Boquerón. Puerto Casado & vicinity, Km 67, Pedersen 4053 16 X 1956 C, P. Sierra Aambay, Bei Esperanza, T. Rojas ex herb. Hassler 10756 II 1908 G, P. Prope Tobaty, Hassler 6138 IX 1900 G. Chaco, Puerto Talavera, K. Fiebrig 1286 IX 1906 G, S.

3. *Cuphea lutescens* ★ Koehne

Koehne in Martius, l.c. 230, 299-300, lám. 55, 2. 1877; Bot. Jahrb. 2: 170. 1882; in Engler, Pflanzenreich 216: 150. 1903. Lectótipo: Brasil, Ribeirão do Prado, Pohl 3291 Holót. W. Isót. W.

C. viscosissima Saint Hilaire, Fl. Brasil. Mer. 110-111 excl. var. *parietarioides*. Tipo: Brasil, Minas Geraes, Minas Novas, dans les pâturages près du village de Nossa Senhora da Penha, St. Hilaire, 1816-21 Holót. P. Isót. P. Non *C. viscosissima* Jacquin

C. lutescens Koehne var. *microcalyx* Koehne, Bot. Jahrb. l.c. 170; in Engler, l.c. Lectótipo Brasil, Minas Geraes, Lagoa Santa, Warming 27 IV 1866 Holót. C.

C. lutescens Koehne var. *macrocalyx* Koehne, ll. cc. Lectótipo: Brasil, Minas Geraes, Caeté, Lund ex herb. Warming XI 1834 Holót. C, Isót. P.

C. villosa Pohl ex Koehne y *C. lanceolata* Pohl ex Koehne, Bot. Jahrb. l.c. 170 Nom. nuda. Non *C. lanceolata* Aiton

Arbusto h. 1,60 m (fide coll.), viscosísimo. Rafz leñosa, ramificada. Tallo marrón-rojizo, leñoso en la parte inferior, desnudos, glabros que se decortican. Ramas densamente pubescentes, pelos finos, blancos, hirsutos y glandulosos violáceos pluricelulares. Internodios (h. 30 mm) en las ramas superiores generalmente en zig-zag. Hojas decuadas, los pares de las ramas floríferas desiguales, una hoja menor h. bracteiforme. Pecíolo 2-10 (22) mm a casi nulos. Lámina oblonga a lanceolada, ovada, asimétrica (15 - 70 x 5 x 20 mm) decurrente en el pecíolo, aguda o subobtusada, discolor, a menudo rojizas; pubescencia cistolítica muy corta, hirsuta, fina, cistolitos generalmente circulares dando apariencia de puntos al caer los pelos; pelos glandulosos finos como en el tallo; 5-12 pares de nervaduras secundarias impresas en el haz, prominentes en el envés generalmente rojizas, base redondeada, subtruncada, raro cuneada, asimétrica. Flores alternas interpecioladas o en cimas breves. Pedúnculos (1 - 2 mm) acrescidos en el fruto, pubescentes. Bractéolas ovadas (0,5 - 1 mm) agudas, ciliado-glandulosas.

Cáliz (7 - 16 mm), nervios dorsales violáceos; densamente glanduloso-pubescente y pelos muy cortos blancos; lóbulos anchos, ciliados; apéndices intersepálicos carnosos, violáceos o verdosos menores que los lóbulos. Interiormente piloso sobre los nervios, más sobre los 2 dorsales, lanoso detrás de los estambres. Pétalos lilas a blancos, o con líneas rosadas, angostamente oblongos o lanceolado-cuneados, obtusos, los dos dorsales algo más anchos y más cortos, con o sin pelos en el dorso del nervio medio. Estambres episépalos generalmente subexsertos, los 3 ventrales glabros, los otros pilosos, a veces todos pilosos. Ovario glabro, asimétrico, Estilo glabro o con pelos esparcidos. Estigma capitado. Disco glandular horizontal, semicupuliforme, grueso, cóncavo, rodeando la base del ovario, dorso carenado. Ovulos 3 - 8.

Semilla rojo-oscuro, obovoideo-aplanada (2 - 2,25 mm), marginada, carúncula notable no prominente (generalmente 3 semillas).

★ El epíteto alude al color del follaje.

Distribución geográfica. Endémica de Brasil, en la región del "cerrado" en altitudes hasta 1300 m.

Material estudiado. BRASIL. Goiás. Chapada dos Veadeiros, 13 Km S of Teresina, Anderson 7264 16 III 1973 NY, P. Rib. Caringa, Pohl 5738 W, Ribeirão do Prado, Pohl 3291 W. Inter Agua Bãa et Río Jequitinhonha Pohl 3125 W. 1 Km E of Alto Paraíso to Nova Roma, 1300 m, Anderson 6347 5 III 1973 NY, P. Minas Geraes. Minas Novas, Nossa Senhora das Penhas, St. Hilaire 1816-21 P. Mun. Datas, Rodovia BR 259, Hatschbach 40832 22 I 1978 MBM, P. Mun. Gouveia, 3 Km S de Arroyo de Tigre, Hatschbach 44735 16 III 1982 MBM, P. Serra do Curral, E. Pereira e Pabst 3278 19 III 1957 HB, P. R. BR 3, Km 432, Pereira, Hatschbach e Pabst 8289 13 IX 1964 HB, P. Caeté, Lund ex herb. Warming XI 1834 C, P. Serra do Espinhaço. Mun. Datas, ca. 15 Km S of Diamantina, 1250 m, Anderson et al. 35526 5 II 1972 NY, P. Ib., Lapinha, 1200 m, Irwin et al. 20843 25 II 1968 NY, P. 30 Km SW of Diamantina to Gouveia, 1300 m, Irwin et al. 21820 13 I 1969 NY, P. Ca. 33 Km NE of San Francisco Sá to Salinas, 1100 m, Irwin et al. 23110 11 II 1969 NY, P. Mun. Jaboticatuba, Río do Cipó, Hatschbach 30022 7 VIII 1972 MBM, P. Mun. Filiberto Caldeira, Curtidor, Hatschbach e Ahumada 31664 16 II 1973 MBM, P. Ca. 15 Km W of Corinto, 600 m, Irwin et al. 26780 2 III 1970 NY, P. Serra do Cabral, E of Joaquim Felício, 1000 m, Irwin et al. 27026 6 III 1970 NY, P. Bahia. Serra do Río de Contas, 980 m, Harley 15365 21 I 1974 K, P. Mun. Río de Contas, Mato Grosso, Hatschbach 46505 16 V 1983 MBM, P. Mato Grosso. Mun. Rondonópolis, Serra da Petrolina, Hatschbach 34140 13 II 1974 MBM, P.

4. *Cuphea persistens* ★ Koehne

Koehne, Verh. Bot. Ver. Brandenburg 30: 277. 1888; in Engler, Pflanzenreich. 149. 1903. Lourteig, Lilloa 9: 373 - 382, fig. 20. 1943. Tipo: Argentina, Tucumán, Sauciliaro, Lorentz et Hieronymus I 1874 Holót. GOT. C. mesostemon Koehne f. ovalifolia Chodat, Bull. Herb. Boissier 7. App. 1: 72. 1899. Tipo: Paraguay, Laguna Ypacaray, Hassler 874. 1.... Holót. G.

C. ovalifolia (Chodat) Koehne, Bull. Herb. Boiss. 2e. sér. 2: 401. 1902. Tipo: el mismo del anterior.

C. persistens Koehne var. formosana Lourteig, Darwiniana 8: 271-272. 1948. Tipo: Argentina, Formosa, Pilcomayo, 3 Km de Portezito, al N, Morrel 3869 6 X 1947 Holót. LIL.

Subarbusto h. 50 cm. Raíces ramificadas. Tallos ramificados desde la base, subleñosos en la parte inferior, procumbentes o erectos; pubescencia cistolítica, setosa hirsuta larguísima y pocos pelos glandulares muy cortos, mezclados. Internodios h. 5 cm, acortados notablemente hacia el ápice. Hojas decusadas, pares muy desiguales en los ramos floríferos, una hoja hasta bracteiforme. Pecíolo h. 5 mm, cari-nulos hacia el ápice. Lámina lanceolada, raro oblonga (10 - 50 x 5 - 20 mm) aguda; base cuneada, raro obtusa, decurrente en el pecíolo; nervaduras salientes sobre el envés; pubescencia corta cistolítica densa, u-

★ El epíteto alude a los pétalos persistentes después de la antesis,

niforme sobre ambas faces, \pm setas esparcidas. Flores alternas interpeciolares o en cimas cortas, axilares. Pedúnculos (1-1,5 mm). Bractéolas cerca del ápice del pedúnculo, ovadas (0,5 - 1 mm) agudas, ciliadas, ápice generalmente con una seta larga.

Cáliz (7,5 - 10 mm) verdoso, dorso violáceo, calcar corto, obtuso; pelos cortísimos en el calcar; sobre los nervios larguísimas setas violáceas, desiguales, hirsutas (en general 1,5 - 3 mm largo); lóbulos triangulares; apéndices intersepálicos menores, setosos. Interiormente piloso sobre los nervios, o sobre los 2 dorsales solamente, lanoso detrás de los estambres. Pétalos lilas a violáceos, lineares a elíptico-cuneados, los dorsales obovado-cuneados, pelos blancos hirsutos en el dorso del nervio medio. Estambres episépalos subexsertos, 3 ventrales glabros, los otros pilosos. Disco glandular grueso, subascendente, concavo, dorso carenado. Ovario semiovoideo-asimétrico, glabro. Estilo villosa. Estigma pequeño. Óvulos 6 - 13.

Semilla parda, obovoideo-aplanada (\pm 3 mm), marginada, finamente foveolada, carúncula notable no prominente.

Distribución geográfica. Vive en campos, cerrado, abras de selva, laderas de montañas. Abundante en el NW de Argentina.

Material estudiado. BRASIL. Mato Grosso. Corumbá, C.A. Conceição 1629 4 X 1985 P. Serra do Aquapei, 3-6 Km N of Fazenda Santa Catarina, 300-400 m, J.H. Kirkbride & E. Lleras 2994 2 III 1977 P, US. Cáceres to S of Serra do Aquapei, Km 135, 190 m, Kirkbride & Lleras 3041 4 III 1977 P, US. SW do Sopé da Serra Bodoquína, Pires e Furtado 17181 20 X 1980 NY, P.

BOLIVIA. Santa Cruz. Prov. Cordillera, Alto Parapefi, 850 m, R. de Michel 111 8 I 1982 LPB, P. Ib., de Michel 239 4 I 1983 LPB, P.

ARGENTINA. Jujuy. Tumbaya, Volcán, Cabrera et al. 15535 27 II 1963 LP P. Santa Bárbara, El Fuerte, Cabrera et al. 17275 5 I 1966 LP, P. Ib., Fabris et al. 5090 11 II 1964 LP, P. Salta. Alvarado, R. Filipovich 295 s.d. P, US. José de San Martín, Coronel Cornejo, Maruñak, Quarín y Schinini 593 9 XII 1972 CTES, P. Tucumán. Taff, Ruta 9, ca. del Cadi-lal, Krapovickas y Cristóbal 14521 1 I 1969 CTES, P. Formosa. Pilcomayo, Puente Hé Bé Chico, Morel 4204 24 XI 1949 LIL. Ib., Puerto Ramos Morel 7140 2 XI 1949 LIL. Ib., 3 Km de Porteñito, al N, Morel 3869 6 X 1947 LIL. (Más material, v. Lourteig, l.c.).

PARAGUAY. Sierra de Anambay, Hassler V 1913 G, P. Ib., Hassler 12096 II 1913 BM, P. Ib., Hassler 11219 V 1913 BM, G, P. Campo Tucanguá, Hassler 3834 I 1900 G, P.

OBS. El material de Bolivia (Santa Cruz) no posee setas ni en las hojas ni en el tallo. En cambio, Hassler 11219, de Paraguay, presenta una densidad superlativa de setas. Las variaciones observadas no presentan ninguna relación fitogeográfica.

★
5. *Cuphea Scolnikiae* Lourt. sp. n.

Herba usque 30 cm alta. Caule e rhizomate radicante, deinde erecto, densissime et adpresse malpighiaceo-pubescente; pilis tenuissimis, anisobrachiatitis aut cystolithicis, pilis brevibus albis vel violaceis et setis longis (0,7 mm) sparsis, intermixtis. Folia tam longa quam internodia vel breviora, elliptica aut lanceolata (13 - 40 x 4 - 18 mm) utraque pagina cystolitico-pubescentes cum setis tenuibus sparsis intermixtis; subtus nervo centrali et 4-7 paribus secundariis conspicuis, hirsuto-pubescentis. Flores pauci, axillares.

Calyx (5,5 - 8,5 mm) calcare obtuso, pubescentia uniformi brevi cum setis violaceis intermixtis; lobuli acuti; appendices intersepálici obtusi quam lobuli minores. Intus biseriatim pilosus in nervis dorsalibus et lanato-pubescentia pone stamina. Petala sex, violacea (4 - 4,5 mm) interdum pilis in dorso nervi centralis; duo dorsalia obovato-spathulata, ventralia elliptico-linearis. Stamina 11; duo dorsalia brevissima, episeála subexserta, 3 ventralia fere glabra, epipetalia densissime lanata. Discus suborbicularis. Ovarium fusiforme, glabrum. Stylus glaber vel pauci pilosus, post anthesim exsertus. Ovula ± 10.

Semina nigra nitida (2,5 x 2 mm), subrectangularia complanata, margine insigniter incrassata ad basim et ad apicem (loco carunculae) interrupta, 4 angulis acutissimis.

Typus: Bolivia, Prov. Itúñez, sobre el Rfo San Martín, Scolnik y Lutti 682 24 XI 1947 Holót. P. Isót. CORD.

Rastrera. Raíz fibrosa, fina, ramificada. Tallo rizomatoso, radicante en la parte inferior, largo (h. 30 cm), pubescencia cistolítica, finísima adpresa o subhirsuta cortísima, en parte malpighiácea (pelos con ramas desiguales), mezclada con pelos muy cortos, blancos o violáceos y algunas setas más largas (0,7 mm), esparcidas. Hojas generalmente del largo de los internodios o más cortas, decusadas, uniformes, subsésiles o pecioladas (h. 2,5 mm). Lámina elíptica a lanceolada (13 - 40 x 4 - 18 mm), aguda, base cuneada, raro obtusa, 4-7 pares de nervaduras secundarias ascendentes, reunidas formando una colectora cerca del margen, prominentes en el envés; pubescencia cistolítica ordenada, densísima (a veces sólo perceptible en el haz), muy corta en el envés, setas finas ± esparcidas sobre ambas faces, nervaduras hirsuto-pubescentes sobre el envés. Flores raras, solitarias, axilares, hacia el ápice de las ramas. Pedúnculo muy corto (h. 1 mm). Bractéolas ovadas (h. 0,5 mm) agudas, ciliadas, adpreso-pubescentes, ca. la mitad del pedúnculo (2).

Cáliz (5,5 - 8,5 mm) calcar redondeado; enangostado en la fauce, pubescencia ± uniforme, corta y setas violáceas mezcladas; lóbulos agudos; apéndices intersepálicos obtusos notamente menores que los lóbulos. Interiormente lanoso-pubescente detrás de los estambres, tubo glabro, los dos nervios dorsales pilosos. Pétalos violáceos (4 - 4,5 mm), a veces con pocos pelos sobre el dorso del nervio medio, hirsutos; los dor-

★Dedicada a Rosa Scolnik, médica argentina (19 -1980) interesada en la fitoterapéutica y que recogió el tipo.

sales obovado-espatulados, subagudos. Estambres 11, los 2 dorsales cortísimos casi glabros, los episépalos subexsertos, casi glabros; los otros menores, densamente lanosos. Disco glandular grueso, subhorizontal, cóncavo superiormente, dorso convexo. Ovario fusiforme, glabro ± tan largo como el estilo. Estilo delgado, glabro o con pocos pelos hacia el ápice, notadamente exserto después de la antesis. Estigma pequeño, capitado. Ovulos ± 10.(3).

Semillas 9, muy características, negras a la madurez (2,5 x 2 mm) subrectangulares, gruesas, aplanadas con márgenes laterales notablemente engrosados, interrumpidos en la base y en el ápice (zona caruncular), presentando 4 ángulos muy agudos.

Distribución geográfica. Vive en la región de la cuenca amazónica, en selva baja, varzea, suelos arenosos, arcillosos, al borde del agua.

Material estudiado. BOLIVIA. La Paz. Prov. Iturrealde, Luisita, 13° 5'S 67° 15'W, 180 m, W Rfo Beni, al lado Rfo Muqui, Beck y R. Haase 9837 22 II 1984 LPB, P. Beni. Prov. Itúñez, sobre el Rfo San Martín, Scolnik y Luti 682 24 XI 1947 P.

BRASIL. Amazonas. Km 21 de Rodovia Itacoatiara - Manaus, E. Oliveira 2909 8 XI 1963 IAN. Mato Grosso. Fazenda Cachimbo, Sub. Base Projeto RADAM 21 ZR - PT, Estrada BR 80, M.R. Cordeiro 1237 20 XI 1976 NY, US. Núcleo Pioneiro de Humboldt, Rfo Aripuana, bel. Salto dos Dardanelos, C.C. Berg et al. 19820 22 X 1973 NY, P.

(1) Es con reserva que ubico esta especie en la Sección Pseudocircaea porque si bien presenta los pétalos persistentes después de la antesis doblándose dentro del cáliz, lo cual constituye el carácter más saliente de la sección, y generalmente pelos en el dorso del nervio medio de los pétalos, lo que así ocurre en las otras especies, las semillas presentan, una forma muy peculiar, muy distinta a la de todas las especies de esta sección.

(2) Las bractéolas de la colección Oliveira 2909, orbiculares (± 2 mm) parecen anormales.

OBS. Dentro de los especímenes estudiados hay variaciones en la composición de la pubescencia. Así, Cordeiro 1237 muestra apenas algunas setas en los ápices jóvenes; Beck y Haase 9877 tiene ramas con setas y otras sin ellas; Berg et al. 19820 es todo setoso. El tipo presenta raras setas y mucha pubescencia unibraquiada.

El cáliz se hace netamente "amplado" en el fruto, conservando la fauce angosta (semejante a C. carthagenensis).

Gracias a los diálogos epistolares con Julián Steyermark pude introducir detalles de interés en la Sección Amazoniana; el rápido préstamo de las últimas colecciones de 1985 decidieron el problema de C. Cardonae Lourt. Los envíos de préstamos de N.Y. Botanical Garden fueron una apreciable colaboración.

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NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). XVII

Harold N. Moldenke

CLERODENDRUM Burm.

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Add to Excluded Taxa: *Ovieda pillo-pillo* Meisn. in Lechl., Berb. Amer. Austr. 53. 1856 = *Ovidia pillo-pillo* Hohen., *Thymeleaceae*.

CLERODENDRUM GLABRUM var. *VAGUM* (Hiern) Mold.

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Illustrations: J. Hutchins., Botanist South. Afr. 399. 1946; Coates & Palgrave, Trees Cent. Afr. [429] (in color). 1957.

This variety differs from the typical form of the species in its decidedly pubescent young branchlets, the leaf-blades being pubescent on the venation above and villous-pubescent throughout beneath,

and the larger externally pubescent calyxes.

A small bush, subshrub, or shrub, or even small shrubby tree, 0.5--10 m. tall, often branched from the base, sometimes with a strong disagreeable odor; crown bushy; stems to 20 cm. in diameter at breast height; branches terete, more or less pilose-pubescent when young with a dense, light-gray, velvety tomentum, especially at the nodes, finally glabrous; bark light-gray, tough, irregularly ridged, flaky, with prominent lenticels; nodes conspicuously thickened; branchlets woody, slender, subterete, stramineous, pilose-pubescent; twigs tinged mauve-brown; wood hard, cross-grained; sap colorless; leaf-scars on old branches very large, prominent, mostly ternate, corky; leaves decussate-opposite or ternate, often short-petiolate, deciduous; petioles very slender, 0.4--2 cm. long, densely pubescent or hirsutulous; leaf-blades subcoriaceous to subchartaceous or membranous, ovate or ovate-lanceolate to oval-elliptic, elliptic-oblong, or oblong, 2.5--8.5 cm. long, 1--5 cm. wide, apically acute or acuminate to obtuse, marginally entire, basally rounded or cuneate and acute, dark-green and sparsely pilose or softly puberulent-pubescent above, especially on the venation, finally glabrescent except for the venation, lighter and more densely pilose-pubescent to velvety-pubescent and glandular-impressed-punctate beneath; midrib slender, impressed above, prominent or prominulent beneath, pubescent on both surfaces; secondaries 4--7 per side, obscure above, arcuate-ascending, often irregularly branched, looping near the margins, prominent or only slightly prominulent beneath; vein and veinlet reticulation fine, rather sparse; inflorescence axillary and terminal, abbreviated, 3--5 cm. long, 2.5--3 cm. wide, densely canescent-villous or villous-tomentose throughout, the cymes compound, dense or loose, densely bracteolate, few- to many-flowered; peduncles slender, 0.5--1 cm. long; pedicels 2--5 mm. long, puberulent or finely pubescent; bracts lanceolate, as long as or longer than the pedicels, pubescent or villous; bractlets and prophylla linear or linear-subulate, 4--8 mm. long, tomentose or villous; flowers regular, unpleasantly (skunk-like) aromatic or fragrant, much frequented by insects; calyx tubular or subtubular to campanulate, 2--5 mm. long, externally villous or tomentose, the rim 5-toothed, the teeth narrow, about 2 mm. long, not spreading, apically acuminate; corolla hypocrateriform, white or pinkish to yellow or mauve, about 3 times as long as the calyx, the tube cylindric, straight, 0.8--1.3 cm. long, the upper portion glandular-pubescent, the lobes oblong or suborbicular, subequal, about 4 mm. long, apically subacute, dorsally glandular-pubescent, ventrally glabrous; stamens longer than the corolla-tube, exserted; filaments and style tinged mauve, purple, or pink to pale-violet; ovary oblong, 2-celled, externally glabrous; ovules 2 per cell; fruiting-calyx shallowly cupuliform, about 5 mm. long and 1 cm. wide, externally more or less pilose or glabrate, very laxly spreading, the rim irregularly lobed; fruit drupaceous, oblong, about 9 mm. long and 6 mm. wide, fleshy, wrinkled in drying, externally glabrous.

This puzzling taxon is based on a Welwitsch collection from Angola; Thomas' *C. glabrum* var. *pubescens* is based on Welwitsch 5752 from near the sea in Benguela, Angola; *C. glabrum* var. *incarnatum* is

based on a Welwitsch collection from Mossamedes; *C. rehmanni* is based on *Rehmann 5066* (according to Thomas) from bushveld between Klippan and the Eland River in Transvaal; while *C. eriophyllum* is based on *Fischer 331* from Tanganyika. *Clerodendron ovale* Klotzsch is based on a Peters collection from Tanganyika. The *C. ovale* credited to Baker and to Kunth are synonyms of typical *C. glabrum* E. Mey.; the *C. ovalifolium* of A. Gray is *Faradaya ovalifolia* (A. Gray) Seem., while *C. ovalifolium* (A. L. Juss.) Bakh. is *C. floribundum* var. *latifolium* F. Muell.

Collectors have encountered *Clerodendrum glabrum* var. *vagum* on anthills, on granite or limestone outcrops and kopjes, among granite boulders in rocky places, along roadsides, on riverbanks, in sand-pits, in bushveld, sandveld, lowveld, and sourveld, in red, sandy, or granitic soil, among large rocks and stones in gritty soil, on bush savannas, on steep rocky hillsides and slopes, in grassland with scattered *Acacia*, *Commiphora*, *Combretum*, and clumps of shrubs, on the banks of seasonal streams with *Zizyphus*, *Acacia*, *Grewia*, etc., clustered in coppices on hillsides, on open-forested, flat, sandy plains, and in open *Brachystegia* woodlands and *Colophospermum* forests, at altitudes of 10--2300 meters, in flower from November to August, and in fruit in May and July.

In Transvaal this plant is reported to be "rare" by Story, "quite common along the range" by Repton, and "a fairly frequent spreading shrub" by Acocks; in Zimbabwe Nornby calls it "occasional". In South Africa it was found by Rodin "on sandy hills with *Syzygium cordatum* intermingled in swamps with *Ficus* and other trees".

Greenway describes it as "a stiffly branched shrub to 15 feet tall with heads of white flowers and aromatic leaves, very locally common in open grasslands with *Apodytes dimidiata*, *Varissa edulis*, *Rhus*, *Heeria*, *Croton macrostachys*, *Euclea* spp., *Osyris abyssinica*, and *Thespesia garckeana* on the lower slopes of mountains in a dark brown loam of volcanic origin" in Tanganyika.

Coates & Palgrave (1957) describe this plant as "a medium-sized tree, reaching 25 to 30 feet in height, with a trunk 4 to 10 inches in diameter and brown in colour.....[with] A one- or two-seeded drupe turning dark brown or black when fully mature" and occurring in Southern Rhodesia [=Zimbabwe]. Northern Rhodesia [=Zambia] and Nyasaland [=Malawi].

Hiern (1900) describes his two varieties of *Siphonanthus glabra* as follows: "Var. *incarnata*. A shrub, 2 to 5 ft. high; branches shortly and softly pubescent, erect or spreading; leaves coriaceous, herbaceous green, somewhat fleshy, 1 to 2 in. long by $\frac{1}{2}$ to 1 in broad, mostly ternate; petiole $\frac{1}{4}$ to $\frac{1}{2}$ in. long; flowers flesh-coloured; stamens 4. Mossamedes. -- In thickets at the mouth of the river Bero, in sandy somewhat salt places; fl. July 1859. No. 5753. This variety has the habit of *S. (Clerodendron) Rehmannii* (Gürke in Pl. Wilm. n. 601) from the Transvaal, but the foliage of our specimens is nearly glabrous and the corolla-tube is shorter.

"Var. *vaga*. A shrub, 2 to 3 ft. high, sparingly branched; branches pallid, tomentellous, rambling; branchlets hoary-tomentose; leaves mostly ternate or quaternate, $\frac{1}{2}$ to 1 in. long by $\frac{1}{4}$ to $\frac{1}{2}$ in. broad,

more or less pubescent; petiole 1/8 to 1/4 in. long; flowers white. Benguella. -- In maritime thickets near Benguella; fl. March 1859. No. 5752."

Dahlstrom collected *C. glabrum* var. *vagum* "in an area considered [to be] the northern outpost of Cape flora, with the precipitation from rain and mist considerably higher than elsewhere in northern Transvaal". Dyer speaks of the "flowers covering the whole tree". Stolz 1166 appears to represent a large-leaved form. Codd 2291 is described by its collector as having "glaucous-pubescent leaves", but the use of the term "glaucous" seems inappropriate here. Sim (1907) distinguishes the variety from the typical form of the species by "the twigs, inflorescence and under surface of young leaves pubescent".

Clerodendron rehmannii var. *tenuifolium* Merxm. is based on Dehn 276 and the type specimen in the Munich herbarium is accompanied by a hand-colored illustration on the sheet. Wager s.n. was annotated in the same herbarium as being from the type locality of *C. rehmannii* but having its leaves "nearly glabrous". Eliovson 27000 is also from the type locality of *C. rehmannii* "and is in fact a very good match with the type collection". West 1083 is said to be "intermediate between *C. rehmannii* and *C. glabrum*, the leaves not profusely gland-dotted beneath". Smits s.n. bears a notation: "This would key out as *C. rehmannii* but I cannot separate it from hairy forms of *C. glabrum*".

Vernacular names recorded for *C. glabrum* var. *vagum* are "nungwangala", "nyaka-chembere", "omululu", "omururu", and "umhlambuzi". The corollas are described as having been "white on Barbosa & Moreno 10144, Chase 5462, Codd 5333, Galpin 9059, Greenway 7742, Peter 40596, Pothill & Paulo 973, Read 1019, Richards 28442, Rodin 4663, Schlieben 3148, 3648, & 9204, Story 1890, Tanner 1479, Teixeira 1783, Torre 8795, Torre & Paiva 10643, Werdermann & Oberdieck 1805, and Wormald 3/51, "dull-white" on Chase 1206, "white-lilac" on Barbosa & Moreno 9834, "pinkish-white" on Mendes 1161, "white or pale-pink" on Acocks 8846, "pink, segments white" on Dyer 3407, "mauve" on Chase 6292, and "yellow" on Gillet 4738.

Keys for distinguishing this plant from its near relatives will be found in the present series of notes under *C. discolor* (Klotzsch) Vatke [59: 259] and *C. dusenii* Gürke [59: 335]. Thomas (1936) separates the taxa in his Section *Odontocalyx* as follows:

1. Branches and lower leaf-surface more or less glabrous; calyx 2--3 mm. long, the teeth awl-shaped and divergent; corolla-tube more or less glabrous.
2. Inflorescence closely compressed; peduncles up to 1.5 cm. long; corolla-tube 5--7 mm. long; no petiolar spur remaining on the branches; supplementary buds not visible.....*C. glabrum*.
- 2a. Inflorescence loose; peduncles to 4 cm. long; corolla-tube 7--8 mm. long; small petiolar spurs on the branches; one supplementary bud plainly visible.....*C. glabratum*.
- 1a. Branches and lower leaf-surface with white pubescence; calyx 4--5 mm. long; corolla-tube glandular-pubescent.
3. Calyx 1/2 split, the lobes plainly divergent; leaf-blades apical-

ly acuminate, basally narrowed into the petiole; corolla-tube 9--10 mm. long.....*C. rehmanni* [= *C. glabrum* var. *vagum*].

- 3a. Calyx 1/3 split, the lobes scarcely divergent; leaf-blades ovate; corolla-tube about 12 mm. long.....*C. eriophyllum* [= *C. glabrum* var. *vagum*].

Baker (1900) separates the taxa as follows:

1. Leaf-blades oblong.
2. Leaf-blades glabrous.....*C. glabrum*.
- 2a. Leaf-blades slightly pubescent beneath.....*C. ovale*.
- 1a. Leaf-blades ovate, basally round, very pubescent.

Pearson (1901) separates them as follows:

1. Leaf-blades profusely gland-dotted beneath; corolla-tube not exceeding 1/3 inch long.....*C. glabrum*.
- 1a. Leaf-blades not gland-dotted beneath; corolla-tube not less than 1/3 inch long.....*C. rehmanni*.

Dale & Greenway (1961) distinguish them as follows:

1. Leaf-blades glabrous or glabrescent.....*C. glabrum*.
- 1a. Leaf-blades always pubescent.....*C. eriophyllum*.

Some parts of *Clerodendrum glabrum* var. *vagum* are used by natives to make a purgative for calves. The roots are pounded into a mash and then made into a porridge to treat human diarrhea.

Rübsaamen (1911) records finding the acarocecidium of gall-insects on the leaves and flowers of this plant in Mombasa.

Dale & Greenway (1961) assert that *C. glabrum* var. *vagum* is found in the southern and coast provinces of Kenya, citing Bally 7712, Drummond & Hemsley 2994, Edwards E.120, Greenway 7742, and Harter 1391. Van der Schijff (1969) lists it from Kruger National Park, citing Codd 5333. Richards & Morony (1969) found it at Mbala, citing Richards 16129. Greenway (1969) cites Bally 7712 from Tsavo East National Park. Wild (1953) cites Allen 257 and Rogers 5528 & 5561 from Victoria Falls.

Baker (1900) cites for *C. ovale*: Hildebrandt 1298, Holst 3076, and Peter s.n. from Tanganyika, and for *C. eriophyllum*: Fischer 331 from Tanganyika.

Pearson (1901) cites for *C. rehmanni*: Rehmann 5066, 5468, 6199, & 6200 and Wilms 601 from Transvaal and Junod 161 from Mozambique, and for *C. glabrum* var. *ovale*: Cooper 1214 and Wood 1204 from Natal.

Thomas (1936) cites for *C. glabrum* var. *pubescens*: Welwitsch 5752 (type) & 5753 from Angola; for *C. rehmanni*: Rehmann 5066 (type) and Wilms 601 from Transvaal, Troll 6007 from Natal, Junod 161 from Mozambique, Verdick s.n. from Zaire, and Merker 725a from Tanganyika; and for *C. eriophyllum*: Busse 1043, Endlich 370, Fischer I.331 (type), Schlieben 3648, and Stolz 1166 from Tanganyika, Engler 2851 from Zimbabwe, and Rehmann 6200 from Transvaal.

Material of *C. glabrum* var. *vagum* has been widely distributed in herbaria as typical *C. glabrum* E. Mey. and also as *C. acerbianum* (Vis.) Benth. & Hook. On the other hand, the Jaasund 2068, Kuntze s.n. [Clairmont, 10/3/94] and Stolz 1166, distributed as var. *vagum*, actually seem to be typical *C. glabrum* E. Mey., Faulkner 2785 is the type collection of *C. eriophylloides* Mold., and Schlieben 5866 is *C. lindense* Mold.

Citations: ZAIRE: Verdick 51 (Br, N). TANZANIA: Tanganyika: Burt 5640 (Br); Busse 1043 [Peter 51871] (B); Endlich 370 (Mu); Faulkner 1869 (S); Greenway 7742 (Af); Peter 36034 [V.142] (B), 36040 [V.142] (B), 40596 [V.241] (B); Rauh 200a (Mu); Richards 28442 (Ac); Schlieben 3148 (Mu), 3648 (B, Br, N, S); Tanner 1479 (Ca--183353, Mi). Zanzibar: Hildebrandt 1298 (V). KENYA: Greenway 8849 (N); Polhill & Paulo 973 (S). ANGOLA: Huila: Barbosa & Moreno 9834 (U1), 10144 (U1); Mendes 1652 (Ld, U1); Torre 8795 (U1). Mossamedes: G. D. Gibson 3 (N, W--2710151); Mendes 1161 (U1), 1228 (U1); Teixeira 1783 (U1). ZIMBABWE: N. C. Chase 1206 (Rh--24250), 5462 (S), 6292 (S); Dehn 276 (Mu, Rh--8742); Eyles 4485 (Rh), 4709 (Rh), 4711 (Um--152); D. E. Gibson 11/51 [Govt. Herb. Salisb. 33067] (N); Govt. Herb. Salisb. 4306 (Rh); Greenlow s.n. [Govt. Herb. Salisb. 33103] (N); J. C. Hopkins s.n. [Govt. Herb. S. Rhodes. 7789] (N), s.n. (Rh--8634); Mullin 74/51 [Govt. Herb. Salisb. 32967] (N); Norlindh & Weimarck 4768 (Mu); Nornby s.n. [Govt. Herb. Salisb. 28408] (N); Obermeyer 2330 (Ld); Seymour-Hall 12/51 [Govt. Herb. Salisb. 33024] (N); Steedman s.n. [Govt. Herb. Salisb. 4179] (N); O. West 2612 (Rh--26463); Wild 3441 [Govt. Herb. Salisb. 28236] (Bm, Ca--921064, N); Wormald 3/51 (Ca--10539). MALAWI: Stolz 1166 [Herb. Transvaal Mus. 24511] (B, E--892762, Ld, Ld--photo, N, N--photo, Ut--64390, Vi). MOZAMBIQUE: Lourenço Marques: Correia 37 (Ld, U1); Junod 161 (Br). Niassa: Torre & Paiva 10642 (U1). NAMIBIA: Loeb & Koch 311 (Ca--058579). BECHUANALAND: Pole-Evans 3266 (Af). SOUTH AFRICA: Cape Province: Kuntze s.n. [Clairmont] (N); Rodin 4663 (Ca--803711). Natal: D. Edwards 1553 (Mu); O. West 1083 (Af). Transvaal: Acocks 8846 (Af); A. G. Baker 541 (Ld--photo, N, N--photo, Na--19744, S--photo); Brain 10333 (Rh--10609); Codd 689 (Ss), 2291 (Ss), 5333 (Af, Ss), s.n. [17-1-1948] (Af, N); Dahlstrand 1517 (Go), 1942 (Go); Dyer 3407 (Af, N); Eliovson 27000 (Af); Galpin 9059 (W--1028990); Gillet 4738 (Cb); Kassner 1334 (Ed); Leendertz 705 [Herb. Transvaal Mus. 8544] (Cb, N), 1906 (Ld--photo, N, N--photo, Na--15690), 1958 [Herb. Transvaal Mus. 6555] (Cb, N); Looea 43 (We); Meebold 12835 (Mu), 12842 (Mu); Mogg 14261 (Ss); Norlindh & Weimarck 5249 (Mu); Repton 587 (Ba, Ka--92310, S); Rodin 4076 (Ca--802185); Schlieben 9204 (Mu); Smuts s.n. [Pietersburg, Dec. 1930] (Af); Stent s.n. [14-2-19] (Ew); Story 1890 (S); Wager s.n. (Tm--22967); Werdermann & Oberdieck 1805 (W--2583122). CULTIVATED: Florida: Gillis 10931 (Ac); R. W. Read 1019 [P.2022] (Ba). MOUNTED ILLUSTRATIONS: Coates & Palgrave, Trees Cent. Afr. [429]. 1957 (Ld).

CLERODENDRUM GLANDULOSUM Lindl., Edwards Bot. Reg. 30 [ser. 2, 7]: 19 in nota [as "*Clerodendron*"]. 1844; Mold., Phytologia 58: 454 & 462. 1985 [not *Clerodendron glandulosum* Colebr., 1829 & 1845].
 Synonymy: *Clerodendron glandulosum* Lindl., Edwards Bot. Reg. 30 [ser. 2, 7]: 19. 1844. *Clerodendron speciosissimum* Hort. Ang. ex Schau. in A. DC., Prodr. 11: 672 in syn. 1847 [not *C. speciosissimum* Paxt., 1837, nor Van Geert, 1836].
 Bibliography: Lindl., Edwards Bot. Reg. 30 [ser. 2, 7]: 19. 1844; Schau. in A. DC., Prodr. 11: 672. 1847; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 88, 109, & ix. 1921; Mold., Phytolo-

gia 58: 454, 457, & 462. 1985.

Lindley (1844) describes this plant as follows: "There is also in English gardens a *Clerodendron*, absurdly called *C. speciosissimum*, which must not be omitted in noticing these plants. It has ovate leaves, not at all cordate, but rather truncate at the base, with few hairs on either side, and no glands; its flowers are in dense heads like those of *C. fragrans*, about the size of *C. squamatum*, and are surrounded by long narrow permanent bracts, which usually have one or more oval glandular spaces on their surfaces; the calyx is not enlarged but its teeth are extended into long narrow tongues. In foliage it resembles *C. trichotomum*, but its inflorescence and calyx are quite dissimilar. It may be called *C. glandulosum*, and thus defined. *C. glandulosum*: foliis subrotundo-ovatis basi truncatis v. parim cordatis pilosiusculis esquamatis subdentatis, paniculâ densâ capitatâ, bracteis lineari-lanceolatis calyce longioribus dorso glandulâ unâ alterâve pellucidâ immersa notatis, calycis 5-fidi laciniis acuminatis, corollas laciniis oblongis reflexis staminibus brevioribus, stylo longissimo".

Schauer (1847) regarded it as a valid species, but Bakhuizen (1921) regarded it as a synonym of what we now call *C. philippinum* Schau. -- obviously unlikely since both Lindley and Schauer kept the two taxa apart.

It is possible, as I indicated in my discussion of *C. colebrokianum* var. *forbesii* King & Gamble [58: 462], that this trinomial may belong in the synonymy of *C. glandulosum* Lindl. It is also possible that *C. glandulosum* may be conspecific with *C. lindleyi* Decaisne, which see. It has also quite naturally been confused with the *C. glandulosum* of Colebrook, which is now known as *C. colebrokianum* Walp., but which it does not appear to be. It has also been regarded as *C. speciosissimum* Van Geert, but Lindley definitely states that this is "absurd". The true identity of what Lindley described as *C. infortunatum* L. on pl. 19 of the Botanical Register seems to be *C. kaempferi* (Jacq.) Sieb. It most certainly is not the white-flowered *C. infortunatum* of Linnaeus.

Nothing is known to me of *C. glandulosum* beyond what is stated in its bibliography (above).

CLERODENDRUM GLOBOSUM Mold., Amer. Journ. Bot. 38: 324. 1951.

Bibliography: Mold., Amer. Journ. Bot. 38: 324. 1951; Mold. in Humbert, Fl. Madag. 174: 154, 229, 231--233, & 267, fig. 37 (6--8). 1956; Mold., Résumé 155 & 450. 1959; G. Taylor, Ind. Kew. Suppl. 12: 26. 1959; Debray in Debray, Jacquem., & Razafind., Contrib. Invent. Pl. Med. Madag. 1: 34. 1971; Mold., Fifth Summ. 1: 260 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 249 & 537. 1980; Mold., Phytologia 58: 189. 1985.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 229, fig. 37 (6--8). 1956.

A shrub or small tree, 3--4 m. tall, apparently quite twiggy; branches and branchlets very slender, gray, glabrous, sometimes ternate; twigs of the same diameter as the branchlets, stramineous, glabrous; nodes usually not annulate; principal internodes often abbreviated and 4--15 mm. long, or elongate to 7 cm. even on the young

twigs; leaf-scars mostly very prominent and corky-margined; leaves mostly decussate-opposite, occasionally ternate, persistent or tardily deciduous; petioles very slender, 2--12 mm. long, flattened and more or less strigillose above, otherwise glabrous; leaf-blades thin-chartaceous or submembranous, grayish-greenish and somewhat lustrous above, not lustrous beneath, lanceolate, 3--9.5 cm. long, 0.8--3.2 cm. wide, apically attenuate-acute or acuminate, marginally entire, basally acute, glabrous on both surfaces, densely impressed-punctate beneath; midrib very slender, flat or slightly prominulous above, prominulous beneath; secondaries filiform, 5--7 per side, arcuate-ascending, rather obscure or very slightly subprominulous on both surfaces; vein and veinlet reticulation obscure or indiscernible on both surfaces; inflorescence terminal, globose-capitate, very densely congested, 1.5--2.5 cm. in diameter, densely many-flowered, conspicuously bracteolate, sessile, usually subtended by 1--3 leaves, occasionally proliferating and binary with one head immediately above the other, the lower one then usually smaller; bracts foliaceous, lanceolate, 1--6 subtending or scattered in the head, usually 1--2 cm. long, 3--6 mm. wide, resembling the leaves in all respects except size; bractlets sublinear, 2 or 3 at the base of each flower, sessile or stipitate, 7--8 mm. long, glabrous or scattered-pilose; pedicels to 2 mm. long or obsolete; flowers fragrant, blooming all through the year; calyx campanulate-conic, about 2 mm. long, its rim deeply 5- or sometimes 6-lobed, the lobes linear-lanceolate, subequal, 3--5 mm. long, apiculate-hooked at the apex, pilose; corolla infundibular, white, its tube 6--7 mm. long, glabrous outside, slightly pilose at the mouth within, its limb 5-lobed, the lobes about 2 mm. long, two slightly shorter than the rest, oblong, apically obtuse; stamens 4, inserted in the upper part of the corolla-tube; filaments filiform, 7--10 mm. long, long-exserted, basally slightly pilose; anthers dorsifixed, dehiscing longitudinally; style cylindric, about 10 mm. long, glabrous; stigma bifid, the branches apparently somewhat unequal; ovary 4-sulcate, externally glabrous; fruiting-calyx incrassate, to about 5 mm. long and 8 mm. wide, venose, externally scattered-pilosulous, its rim deeply 5-lobed with elongate-lanceolate lobes or else these lobes broken off; fruit drupaceous, subglobose, to about 1 cm. long and wide, nigrescent and shriveled in drying and deeply sulcate, yellow and sweet when fresh, edible, often insect-galled.

This endemic Madagascar species is based on *Humbert & Perrier 2468* from the vicinity of Tulear, on the Fiherenana delta, at 2--10 m. altitude, in southwestern Madagascar, collected between September 14 and 25, 1924, and deposited in the Paris herbarium.

Collectors have encountered this plant on sand and limestone soil, on dunes, and in sandy or calcareous alluvium and shores, at 2--50 m. altitude, in flower in January, June, August, and September, and in fruit in August, but it is said to flower and fruit throughout the year. The only vernacular name reported for it is "varo". All collectors who describe the color of the corolla (*viz.*, *Decary 2846*, 9160, & 9601, *Greve 51*, *Humbert & Perrier 2468*, *Humbert & Swingle 5344*, and *Perrier 12823*) uniformly refer to it as "white".

A key to distinguish this species from the other Madagascar members of the genus will be found under *C. baronianum* Oliv. in the present series of notes [58: 184--190].

Citations: MADAGASCAR: *Decary* 2846 (P), 3530 (N, P), 8542 (P), 9159 (P), 9160 (P), 9601 (P); *Grandidier* s.n. [Fev. 1869] (P); *Greve* 51 (P); *Humbert* 20078 (P); *Humbert & Perrier* 2468 (E--photo of type, F--photo of type, Ld--photo of type, N--photo of type, P--type); *Humbert & Swingle* 5344 (P, P, W--1528565); *Perrier* 10236 (P), 12823 (P), 19245 (P); *Poisson* 379 (P).

CLERODENDRUM GLOBULIFLORUM Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 99--100. 1936.

Bibliography: B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 6, 8, 38, 63, 93, & 99--100. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 47, 48, & 90. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 55. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 113, 114, & 181. 1949; Mold., Résumé 139 & 450. 1959; H. Huber in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 439 & 443. 1963; Mold., Résumé Suppl. 15: 7. 1967; Mold., Fifth Summ. 1: 221, 223, & 225 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 212, 214, 215, & 537. 1980.

A shrub, about 2 m. tall, few-branched; branches spinose, gray-fuscos, excavated, glabrous, with accessory buds; leaves decussate-opposite, large; petioles 1--4 cm. long, glabrous; leaf-blades elliptic-oblong, 15--25 cm. long, 8--12 cm. wide, apically acuminate, marginally entire, basally attenuate, glabrous on both surfaces; flowers aggregate into globose cauline heads borne on the older wood; peduncles short; pedicels about 1 cm. long; bracts and bractlets subulate, about 1--1.5 cm. long, hispid; calyx globose-campanulate, about 4 mm. long and 3 mm. wide, externally glabrous or slightly ciliate; corolla yellowish, its tube about 6 cm. long, curvate, glandular-pilose, basally and apically somewhat dilated, the lobes 5, subequal, ovate-oblong, about 1.2 cm. long, distant; stamens exserted, inserted below the mouth of the corolla-tube; filaments about 8.5 cm. long; anthers 2 mm. long; style about 9 cm. long, surpassing the stamens; stigma shortly bifid; ovary about 3 mm. long; fruiting-calyx widely spreading, the limb 1.5--2 cm long, split almost to the base into 5 lanceolate or ovate-triangular lobes which are basally about 8 mm. wide, apically acute, with prominent veins.

The type of this species is *Mildbraed* 6345 from the north side of St. Isabel peak, "oberhalb Basilé, Wald über der Kakaoregion", at 600--800 m. altitude, Fernando Po, collected on August 16, 1911, and deposited in the Berlin herbarium, now destroyed.

Huber (1963) describes the plant as having white corollas and violet to brownish-purple calyces, citing *Brenan* 8829, *Mutch* FHI. 21853, *Onochke* FHI.40414, *Onyegocha* FHI.7707, and *Talbot* s.n. from Southern Nigeria, *Conrau* 249, *Daramola* FHI.40612, *Johnston* s.n., *Keay* FHI.37536, and *Weberbauer* 58 from British Cameroons, and *Mildbraed* 6345 from Fernando Po, asserting that it is also found in French Cameroons.

Thomas (1936) cites only *Mildbraed* 6345 from Fernando Po and

Conrau 249, *Weberbauer 58*, and *Winkler 842* from the Cameroons.

Nothing is known to me of this taxon beyond what is stated in its bibliography (above).

CLERODENDRUM GODEFROYI Kuntze, Rev. Gen. Pl. 2: 505--506 [as "*Clerodendron*"]. 1891; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942.

Synonymy: *Clerodendron godefroyi* Kuntze, Rev. Gen. Pl. 2: 505.

1891. *Clerodendron godefroyi* Dop ex Mold., Résumé 263 in syn. 1959.

Bibliography: Kuntze, Rev. Gen. Pl. 2: 505--506. 1891; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101. 1901; Craib, Kew Bull. Misc. Inf. 1914: 284. 1914; Dop in Lecomte, Notul. Syst. 4: 13 & 13. 1920; Fedde & Schust., Justs Bot. Jahresber. 48 (1): 497. 1927; Dop in Lecomte, Fl. Gen. Indo-chine 4: 851 & 870--871. 1935; E. D. Merr., Brittonia 2: 197. 1936; E. D. Merr., Journ. Arnold Arb. 19: 65. 1938; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 101. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 61. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 136 & 181. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; Mold., Résumé 175, 263, 272, & 450. 1959; Mold., Fifth Summ. 1: 299, 446, & 462 (1971) and 2: 866. 1971; Mold., Phytologia 31: 395. 1975; Mold., Phytol. Mem. 2: 284, 288, 291, 386, & 537. 1980.

An erect, puberulent shrub or subshrub, to 2 m. tall; stems erect, terete or the younger parts subtetragonal; branches subtetragonal, fistulose, puberulent; leaves decussate-opposite, those of the inflorescence much smaller and shorter; petioles 1--2 cm. long, pubescent, canaliculate above; leaf-blades membranous or chartaceous, ob-oval or elliptic to elliptic-oblong, 5--10 cm. long, 2.5--3.5 cm. wide, apically acuminate and often mucronulate, marginally entire, basally rounded or obtuse to acute, rugose and sparsely pilose above, softly pubescent beneath; secondaries 12--16, ascending, recurved, prominent (like the midrib); tertiaries irregular; veinlet reticulation more or less distinct; inflorescence terminal or partly subterminal, broadly paniculate, 10--17 cm. long, 8--10 cm. wide, 2--3 times dichotomous, many-flowered, glandular-pubescent, the ultimate cyme-branches racemiform; bracts elliptic-lanceolate, foliaceous, apically mucronulate; bractlets subulate, 4--8 mm. long; pedicels very short, the upper 1--5 mm. long, the lower to 1 cm. long; calyx turbinate, herbaceous, green, 7--8 mm. long, externally somewhat silky-glandular-pubescent, the tube 2--3 mm. long, deeply 5-fid, the segments lanceolate, equal, herbaceous, green, 3--5 mm. long, apically acute; corolla white, 2--3 cm. long, glabrous or subglabrous, the tube very slender, 2.5 cm. long, upwardly slightly ampliate, almost straight, the limb in bud globose but finally 4-lobed, the lobes oblong, subequal, 8--9 mm. long, apically obtuse, two reflexed, the other three forming a lip; stamens long-exserted; filaments filiform; anthers large, oblong; style slender, long-exserted by 2--3 cm.; stigma shortly bifid, the branches apically acute; fruiting-calyx accrescent, red-violet, 2.5 cm. wide; fruit drupaceous, about 1 cm. long, black.

This species is based on an unnumbered Godefroy collection gath-

ered somewhere in Cochinchina, Vietnam, in September, 1875, and deposited in the Kew herbarium. Kuntze (1891) comments that "Sie ähnelt einerseits *Cl. multiflorum* [now called *C. phlomidis* L. f.], aber die Blätter sind nicht oval rhombisch auf fast gleichlangen Stielen, auch nicht gekerbt gezähnt, die Kelche sind nicht kahl, aufgeblasen und etwa nur halbsogross, die Bracteen viel schmaler fast fädlich, die Inflorescenzzweige doppelt länger. Andererseits ist *Cl. Sieboldii* OK. = *Cl. divaricatum* S. & Z. nec Jack [now called *Caruopteris chosenensis* Mold.] zu vergleichen, aber ebenfalls durch die ganzrandigen obovaten, ausserdem nicht lang zugespitzten und nicht kahlen Blätter verschieden; ferner hat *Cl. Sieboldii* nur kurz gezähnten (nich 2/3 getheilte Kelche) Ketchen, z. Th. -- 3 cm lange Blütenstiele etc."

Merrill (1936) states that *C. godefroyi* "is not represented in Kuntze's herbarium", but this is not so -- it is well represented by Kuntze s.n., collected in Cambodia in March, 1875, deposited in the Britton Herbarium at the New York Botanical Garden. In his 1938 work he compares his *C. squiresii* (a synonym of *Glossocarya siamensis* Craib) with *C. godefroyi* and claims that they are very similar and "apparently belonging" in the "same group" of the genus.

Collectors have found *Clerodendrum godefroyi* along highways in limestone mountains, at 250--350 m. altitude, in flower in June and November. Collectors who describe the flower color at all (viz., Charoenphol & al. 4519 & 4581 and Pierre 5224) uniformly refer to it as "white".

Dop (1935) cites unnumbered collections of Harmand and of Thorel from Laos, of Colliard, Geoffray, Lecomte & Finet, and Poilane from Cambodia, and of Geoffray, Pierre, and Poilane from Cochinchina.

A key to help distinguish this species from other Indochinese taxa will be found under *C. hahnianum* Dop in the present series of notes.

Citations: THAILAND: Charoenphol, Larsen, & Warncke 4519 (Ac), 4581 (Ac). CAMBODIA: Kuntze s.n. [III.1875] (N). LAOS: Thorel 2197 (Ca--54661). VIETNAM: Cochinchina: Pierre 5224 (B, Ca--53746, Ca--54647, N, S); Poilane 697 (F--photo, Ld--photo, N, S, Sg--photo). Tonkin: Poilane 8524 (W--2394552).

CLERODENDRUM GODEFROYI var. *INSULARE* Dop in Lecomte, Notul. Syst. 4: 12 [as "*Clerodendron*"]. 1920; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942.

Synonymy: *Clerodendron godefroyi* var. *insulare* P. Dop in Lecomte, Notul. Syst. 4: 12. 1920.

Bibliography: Dop in Lecomte, Notul. Syst. 4: 12. 1920; Fedde & Schust., Justs Bot. Jahresber. 48 (1): 497. 1927; Dop in Lecomte, Fl. Gén. Indo-chine 4: 871. 1925; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90 (1942) and ed. 2, 136 & 181. 1947; Mold., Résumé 175 & 450. 1959; Mold., Fifth Summ. 1: 299 (1971) and 2: 866. 1971; Mold., Phytologia 31: 395. 1975; Mold., Phytol. Mem. 2: 291, 386, & 537. 1980.

This variety differs from the typical form of the species in having its leaf-blades oboval or oblanceolate, apically acute or acum-

inate, basally acute or long-attenuate, and less pubescent or even glabrescent on both surfaces.

The variety is based on *Harmand 846*, *Lanessan 186*, and *Talmy s.n.* from Poulo-Condor, Cochinchina, Vietnam. Dop (1920) comments that "Tous les intermediaires existent entre l'espece type et le type extreme de la variete".

Citations: VIETNAM: Cochinchina: *Lanessan s.n.* (B).

CLERODENDRUM GODEFROVI var. *OBLANCEOLATUM* Dop in Lecomte, Notul.

Syst. 4: 12 [as "*Clerodendron*"]. 1920; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942.

Synonymy: *Clerodendron godefrovi* var. *oblanceolatum* Dop in Lecomte, Notul. Syst. 4: 12. 1920.

Bibliography: Dop in Lecomte, Notul. Syst. 4: 12. 1920; Fedde & Schust., Justs Bot. Jahresber. 48 (1): 497. 1927; Dop in Lecomte, Fl. Gén. Indo-chine 4: 871. 1935; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90 (1942) and ed. 2, 136 & 181. 1949; Mold., Résumé 175, 272, & 450. 1959; Mold., Fifth Summ. 1: 299 & 462 (1971) and 2: 866. 1971; Mold., Phytologia 31: 395. 1975; Mold., Phytol. Mem. 2: 288, 386, & 537. 1980.

This variety differs from the typical form of the species in having its leaf-blades oblanceolate or lanceolate and marginally entire or somewhat sinuate.

The variety is based on *Lecomte & Finet 1446*, *1478*, & *1590* from Daban, Dalat, Cambodia. Dop (1935) cites also an unnumbered Evrard collection from Annam. In his 1920 work he comments that "Cette variete, qui est intermediaire entre l'espece type et le *Cl. Lloydianum* Craib, est constamment parasitée par un champignon dont les pycnides recouvrent toute la surface foliaire".

Nothing is known to me of this taxon beyond what is stated in its bibliography (above).

CLERODENDRUM GOSSWEILERI Exell in Good & Exell, Journ. Bot. Brit.

68, Suppl. 2: 142--143 [as "*Clerodendron*"]. 1930; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 41, 71, & 93. 1936.

Synonymy: *Clerodendron gossweileri* Exell in Good & Exell, Journ. Bot. Brit. 68, Suppl. 2: 142. 1930. *Clerodendron gossweileri* R. Good apud Fedde & Schust., Justs Bot. Jahresber. 58 (2): 329 sphalm. 1938.

Bibliography: Exell in Good & Exell, Journ. Bot. Brit. 68, Suppl. 2: 142--143. 1930; A. W. Hill, Ind. Kew. Suppl. 8: 54. 1933; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 41, 71, & 93. 1936; Fedde & Schust., Justs Bot. Jahresber. 58 (2): 329. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 50 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 62. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 118 & 181. 1949; Mold., Résumé 146 & 450. 1959; Mold., Fifth Summ. 1: 242 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 2: 232, 386, & 537. 1980.

A shrub or tree; branchlets minutely pubescent; leaves subopposite; petioles rather stout, 1.5 cm. long, tomentose; leaf-blades obovate, about 17 cm. long and 10 cm. wide, apically subacuminate, marginally plainly dentate, sparsely puberulent or subglabrous above,

pubescent beneath especially on the venation; inflorescence terminal, composed of dense subcapitate cymes; flowers very numerous, pedicellate; peduncles to 15 cm. long, branched near the apex, minutely pubescent; pedicels 2 mm. long, appressed-pubescent; calyx externally sparsely puberulent, the tube 3 mm. long, the lobes ovate-triangular, 1.5 mm. long; corolla hypocrateriform, its tube to 2.5 cm. long, narrow, about 5 times as long as the calyx, sparsely pilose or sometimes subglabrous, the lobes much shorter than the tube, 2.5--3 mm. long, 2 mm. wide, glabrous; stamens plainly exserted, projecting about 1.5 cm. beyond the corolla-mouth.

This species is based on *Gossweiler 8830* from 900 m. altitude at Rianzondo, near the Lucala River, Duque de Bragança, in the Cuanza Norte district of Angola, flowering in September, and deposited in the herbarium of the British Museum in London.

Exell (1930) notes: "Probably nearest to *C. Bakeri* Gürke [now known as *C. schweinfurthii* var. *bakeri* (Gürke) Thomas], from West Tropical Africa, but distinguished by the pubescence on the lower surface of the leaves and on the calyx, and by the smaller corolla-lobes".

Thomas (1936), citing only the type collection, says "Diese Art ist mir nur aus der Beschreibung bekannt; danach dürfte sie mit der vorigen [*C. schweinfurthii* Gürke] identisch sein".

Citations: ANGOLA: Loanda: *Gossweiler 8830* [Mo. Bot. Gard. Type Photo A.885] (Gz--photo of type, N--photo of type).

CLERODENDRUM GRANDIFLORUM (Hook.) Schau. in A. DC., Prodr. 11: 659 [as "*Clerodendron*"]. 1847; Mold., Geogr. Distrib. Avicenn. 5. 1939.

Synonymy: *Aegiphila grandiflora* Hook., Curtis Bot. Mag. 72 [ser. 3, 2]: pl. 4230. 1846. *Clerodendron sagraei* Schau. in A. DC., Prodr. 11: 659. 1847. *Clerodendron grandiflorum* (Hook.) Schau. in A. DC., Prodr. 11: 659. 1847 [not H. J. Lam, 1919]. *Rondeletia* sp. "de la Havane" ex Lemaire, Fl. Serres, ser. 1, 4: 324 in syn. 1848. *Aegiphila aurea* Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 218. 1863. *Citharexylum longiflorum* Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 207--208. 1863. *Clerodendron grandiflorum* Schau. apud Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1156. 1876. *Clerodendrum sagraei* [Schau.] apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 18. 1936. *Clerodendron diversifolium* L. C. Rich. ex Mold., Prelim. Alph. List Inv. Names 19 in syn. 1940 [not Vahl, 1891. *Citharexylum longiflorum* Turcz., ex Alain in León & Alain, Fl. Cuba, imp. 1, 4: 301 sphalm. 1957. *Clerodendron sagraeum* Schau., in herb.

Bibliography: W. Hook., Curtis Bot. Mag. 72 [ser. 3, 2]: pl. 4230. 1846; Paxt., Mag. Bot. 13: 115, 217, 218, & 275. 1847; Schau. in A. DC., Prodr. 11: 655 & 659. 1847; Lemaire & Van Houtte, Fl. Serres, ser. 1, 4: 324--324b, pl. 324. 1848; A. Rich. in Sagra, Hist. Fis. Polit. Nat. Cuba 11 (2): 147. 1850; Buek, Gen. Spec. Syn. Candoll 3: 9 & 106. 1858; Sagra, Icon. Pl. Fl. Cub. 41. 1863; Turcz., Bull. Soc. Imp. Nat. Mosc. 36 (2): 207--208 & 218. 1863; Griseb., Cat. Pl. Cub. 216. 1866; Pritzel, Icon. Bot. Ind. 1: 23. 1866; Hereman, Paxt. Bot. Dict. 13. 1868; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1156. 1876; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 46,

549, & 561. 1893; Urb., *Symb. Antill.* 3, imp. 1, 368. 1903; O. E. Schulz in Urb., *Symb. Antill.* 6: 68--69. 1909; H. J. Lam, *Verbenac. Malay. Arch.* 320 & 363. 1919; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 95. 1921; Stapf, *Ind. Lond.* 1: 79. 1929; Mold., *Brittonia* 1: 468--469 & 472. 1934; B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 18. 1936; Mold., *Geogr. Distrib. Avicenn.* 4, 5, & 37. 1939; Mold., *Prelim. Alph. List Inv. Names* 2, 19, 20, & 21. 1940; Mold., *Alph. List Inv. Names* 2, 17, 19, & 21. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 24, 72, 84, 88, & 90. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 46, 549, & 561. 1946; Mold., *Alph. List Cit.* 1: 3, 5, 15, 24, 67, 89, 99, 116, 118, 186, 187, 273, 315, & 316 (1946), 2: 347, 349, 358, 418, 466, 468, 646, 647, & 649--651 (1948), 3: 663, 695, 866, 869, 889, 924, & 930 (1949), and 4: 1021, 1030, 1035, 1038, 1084, 1137, 1144, & 1162. 1949; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 42, 43, 45, 158, 174, 179, & 181. 1949; Roig, *Dicc. Bot. Nom. Vulg. Cub.* 2: 716 & 1005. 1953; Syngé in Chittenden, *Roy. Hort. Soc. Dict. Hort.*, ed. 2, 1: 505. 1956; Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 299, 301, 310, & 319--321, fig. 138. 1957; Mold., *Biol. Abstr.* 32: 2353. 1958; Mold., *Phytologia* 6: 276 (1958), 6: 453--454 (1959), and 7: 76. 1959; Mold., *Résumé* 50, 51, 53, 216, 229, 252, 262, 264, 268, 273, 440, 447, & 450. 1959; Mold., *Résumé Suppl.* 1: 4, 15, 16, & 25. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 46, 549, & 561. 1960; Mold., *Biol. Abstr.* 36: 4036. 1961; Mold., *Phytologia* 7: 458. 1961; Hocking, *Excerpt. Bot. A.5:* 44. 1962; Urb., *Symb. Antill.* 3, imp. 2, 368. 1964; Liogier, *Fl. Cub. Supl.* 124. 1969; Mold., *Fifth Summ.* 1: 95, 98, 358, 378, 379, 427, 434, 446, 454, & 465 (1971) and 2: 866. 1971; Gibbs, *Chemotax. Flow. Pl.* 3: 1753 (1974) and 4: 2080. 1974; Alain in León & Alain, *Fl. Cuba*, imp. 2, 2: 299, 301, 310, & 319--321, fig. 138. 1974; Mold., *Phytol. Mem.* 2: 88, 91, 349, & 537. 1980; Capote & García, *Revist. Jard. Bot. Nac.* 4: 48. 1983; H. N. & A. L. Mold. in Dassan. & Fosb., *Rev. Handb. Fl. Ceyl.* 4: 418. 1983; Raj, *Rev. Palaeobot. Palyn.* 39: 358, 374, 383, & 394. 1983; Mold., *Phytologia* 57: 478 (1985), 58: 198 (1985), and 59: 117, 252, 344, & 347. 1986.

Illustrations: W. Hook., *Curtis Bot. Mag.* 72 [ser. 3, 2]: pl. 4230 (in color). 1846; Paxt., *Mag. Bot.* 13: 217 (in color). 1847; Lemaire & Van Houtte, *Fl. Serres*, ser. 1, 4: pl. 324 (in color). 1848; Alain in León & Alain, *Fl. Cub.*, imp. 1, 4: 320, fig. 138 (1957) and imp. 2, 2: 320, fig. 138. 1974.

A shrub or tree, 1--4 m. tall; branches sometimes procumbent; branchlets slender, light-gray or almost white, obtusely and usually obscurely tetragonal or terete, glabrous, tuberculate; twigs similar to the branchlets but buff-colored or brownish and more or less puberulent or pubescent, often more or less verruculose-lenticellate; nodes tetragonal-compressed, not annulate; principal internodes 1--10.5 cm. long; leaves decussate-opposite or whorled in 5's, the members of a pair or whorl often approximate; petioles slender or stoutish, 2--9 mm. long, minutely puberulent; leaf-blades firmly chartaceous or coriaceous, bright- or dark-green above, lighter beneath, elliptic, obovate, or oblanceolate to obovate-oblong, oblong, or sub lanceolate, 4--21 cm. long, 1.8--7.2 cm. wide, apically round-

ed to abruptly short-acuminate or short-cuspidate, marginally entire and revolute, basally acute or rounded to narrowly subcordate, glabrous above or obscurely puberulent along the midrib, minutely puberulent on the venation or glabrous beneath; midrib slender, flat above, prominent beneath; secondaries slender, 6--8 per side, arcuate-ascending, prominulent beneath; vein and veinlet reticulation abundant, slightly prominulent beneath, the larger portions often also subprominulent above; inflorescence axillary or subterminal to terminal, cymose-corymbose or paniculate, 9.5--12 cm. long, trichotomous, few-flowered or loosely many-flowered, usually 9--18-flowered, subequalling the subtending leaves, basally bibracteolate; peduncles slender, 3.5--12 cm. long, minutely puberulent, buff-colored; pedicels very slender, 4--13 mm. long, minutely puberulent; bracts none; bractlets few, linear, 2--4 mm. long, puberulent; prophylla linear or setaceous, 1--2 mm. long, puberulent; flowers nutant during anthesis; calyx campanulate or cupuliform, about 3 mm. long, membranous, rather broad, 5-angular, basally nigrescent, externally puberulent or hirtellous, the rim truncate and shortly 5-dentate, the teeth very small, apically cuspidate, basally subquadrangular, reflexed; corolla tubular-infundibuliform, yellow, 2--3 cm. long, externally puberulent or softly pubescent, internally glabrous, 5--6 times as long as the calyx, its tube 4--5 times as long as the calyx, the limb small, 5-lobed, often not spreading, the lobes ovate, subequal, apically acute, erect or spreading; stamens inserted in a whorl in the lower portion of the corolla-tube, in 2 unequal pairs, long-exserted; filaments slender, twice as long as the anthers, glabrous, basally dilated; anthers dorsifixed, oblong-sagittate or elliptic; style filiform, as long as the stamens, not thickened apically; stigma bifid; ovary globose, 4-celled, each cell 1-ovulate; fruiting pedicels erect; fruiting-calyx somewhat accrescent, pelviiform; fruit drupaceous, obovate or obovate-rotund to oblong, 7--10 mm. long, 6--11 mm. wide, apically compressed, very fleshy, externally glabrous or pulverulent, blue or light-blue, glaucous, nigrescent in drying, composed of 4 (or by abortion only 1--3) elongate semicylindric pyrenes, the pulp greenish.

Although it is now known that this species is endemic to Cuba, Hooker (1846) says: "Of the native country of this very pretty shrub I regret to say we are ignorant. We are indebted for flowering specimens, in December, 1845, to Mr. Henderson, of Pine-apple Place, Kensington, who received plants from Mr. Makoy, of Liège, under the erroneous name of '*yellow Rondeletia*'; and about the same time also, from Messrs. Lucombe and Pince, of the Exeter Nursery. It is quite clear that this is no *Rondeletia*, nor any Rubiaceous plant, but a true *Aegiphila*, with singularly large yellow tubular flowers, well worthy of a place in every collection, flowering as it does in the middle of winter in a warm stove, and then the flowers are succeeded by the glaucous-blue berries." Actually the fruits are drupes and the plant is not an *Aegiphila*, but is a true and typical *Clerodendrum*.

[to be continued]

MEDEOLA VIRGINIANA L.

AN ADDITION TO THE LOUISIANA FLORA

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Medeola virginiana L. (Liliaceae), Indian cucumber-root, is listed in a number of regional flora (e.g., Gleason and Cronquist, 1963; Rickett, 1967; and Small, 1933) as occurring "to Louisiana". However, no record of Medeola having been previously collected in Louisiana is known, nor does it occur on a recent state checklist (Thomas and Allen, 1984).

A population of two to three dozen plants of Medeola was found in flower on a sandy hill near Pushepatapa Creek in Sec. 38, T1S, R12E, Washington Parish, Louisiana, in May, 1985. Washington Parish has been previously surveyed (Taylor and Thomas, 1985) and its unique plants reported (Thomas and Taylor, 1986). Medeola was discovered during a spring 1985, survey of approximately 37 acres along Pushepatapa Creek. This survey was undertaken because of the relatively undisturbed nature of the tract. Conversations with local residents indicate the area has not been logged since the early 1900's. The habitat is hilly, mesic hardwood forest located within Louisiana's longleaf pine vegetation zone.

The Pushepatapa Creek watershed is well known to Louisiana botanists to contain a number of plants unusual to the area. It is, for example, the only known Louisiana location for Quercus laevis Walt. (turkey oak) and Thelypteris noveboracensis (L.) Nieuwl. (New York fern) (Thomas, personal communication). This habitat is ecologically significant and is probably the western limit of Medeola's geographic distribution as well as for other species.

The Nature Conservancy's Louisiana Natural Heritage Program has assigned Medeola to its rarest plant status (S1) for the state (Parker, 1986). Voucher specimens are deposited in the herbaria of Northeast Louisiana University, Monroe, and Southeastern Louisiana University, Hammond.

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PLANTAE MESOAMERICANAE NOVAE. XI.

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Mapania Herrerae Gómez-L., sp. nova. Species valde distincta in sectione Pycnocephala. Inflorescentia corymbosae, achaeniae forma et amplitude, axis culmusque strigosus facile cognoscenda.

Planta mediocris. Rhizomate rectum, squamis atroavellaneis vestiti, 1-2-caespens formans. Radices fibrosas, validas, usque 30 cm longas. Culmus 90-130 cm altus, medio circa 4 mm crassus, solitarius, centralis, trigonus, pauce nodosus, versus apicem strigosus, basi foliatus, foliis brevior. Cataphylla pauca, 3-4 cm longa, ovata. Folia normalia pauca, elongatissima, 134-155 cm longa, 25-31 mm lata, unicostata; lamina conspicue transversaliter septata, margine et costa infra sursum serrulato-scabra, basi sensim angustata, apicem longe acuminata; vaginas 15-23 cm longas, ochraceas, cinnamomum suffusas, margine membranaceas, sursum cinnamomeis. Folia caulina plerumque 2, 92-130 cm longa; vaginas 2.5-10 cm longas, basis ferrugineo-strigosas. Bracteae involucentes folia similis, inaequalis, patentes ima longissima 46-76 cm longa, evaginant, apicem acuminatissima. Bracteolae longe subulatae. Inflorescentia corymbosae, 4.5-6.5 cm longa, 4-8 cm lata; axis elongatus, 4-10 cm longus, internodios 1-7 cm longos, strigosus. Radii 5-8, inaequalis, 1-6 cm longis, medio 1-1.8 mm latis, subterete usque breviter complanatis, strigosis, in capitulo unico terminanti. Prophylla papyracea, fusca, bicostata, strigosa, apicem profunde bifida. Capitula plerumque globosa, maturitate 19-30 mm in diametro, multispiculata congestae. Spicae 8-10 mm longae, 3-3.5 mm crassae, ovatae, apice acutae, margine scariosae. Squamellae 4, 4-5.5 mm longae, lineari-lanceolatae, valde plicatae, hyalinae; lateraliter oppositae, costa spinulosa-scabridae. Antherae 3 mm longae. Stylus gracilis, bifidus, persistentibus. Achaeniae latae aobovatae vel globosae quasi pyriformia, 1.5-1.8 mm longae, 1.3-1.5 mm latae, facies tumidae, fuscae, in medio ochraceae, nitentes, utrinque leviter costulatae, maturitatem breve stipitata. Fig. 1.

Gerardus Herrera, amicus atque infatigabile collectore speciem hanc novam cordialiter dicatur. HOLOTYPUS: camino de Fila Dimat (casa de Hermógenes Pereira) hacia Soki, Quebrada Sha. Prov. Limón, 16-X-1985. Leg. L. D. Gómez, G. Herrera & D. Masterson 23860, CR. ISOTYPUS: F, MO, USJ.

Mapania Aublet (Cyperaceae, Mapanioidae) es un género tropical de unas 50 especies con su centro de dispersión en Malasia (f. Koyama, Mem. N. Y. Bot. Garden 17(1):49-68. 1967). Koyama agrupa las especies en ocho secciones, las neotropicales en secciones Mapania, Pycnocephala C.B. Clarke y Tepuianae T. Koyama. A pesar de que todas

las especies americanas de la sección *Pycnocephala* presentan una inflorescencia monocéfala, típicamente, algunas características como las dimensiones de los aquenios, ausencia de una porción esponjosa en los aquenios y el grado de connivencia de las escuámulas, sugieren cierta afinidad de *M. Herrerae* con esa sección. Con este hallazgo, se elevan a tres las especies centroamericanas del género, que se pueden diferenciar mediante la clave siguiente:

- 1a- Plantas con hojas reducidas a vainas sin lámina. Estilo trifido.
Mapania assimilis
- 1b- Plantas con hojas normales. Estilo bifido2
- 2a- Inflorescencia una cabeza terminal casi sésil. Culmos sin nudos.
Mapania pycnocephala ssp *pycnocephala*
- 2b- Inflorescencia corimbosa con el eje muy alargado, estrigoso. Culmos nodosos.
Mapania Herrerae

Elaphoglossum L. D. GÓMEZ

Elaphoglossum Lalitae L. D. Gómez, sp. nov. Rhizomate brevi, lignoso, erecto, squamis membranaceis, tenuis, amplissime obovato-ellipticeis, avellaneis densissime obtecto. Stipitibus (30)-35-(40) cm longis, gongestis, sine phyllopodia, dense squamosi, paleis rhizomatibus similibus, canaliculati, stramineis, 3-4 mm crassi. Limbo sterili oblongo-lanceolato, subcoriaceo, utrinque viridi sed subtus pallidiori, glabro, praeter costam utrinque squamulis vestito, 60-85 cm longo, 9-10 cm lato. Costa robusta, subtus exserta, scamosa, supra sulcata et ad basim scamosa deinde glabrata; venis patentibus 1-furcatis vel simplicis, ab origine 7-8/cm, sine hydathoda. Limbo fertili 40-50 cm stipitato, stipitibus densissime rhizomatibusque scamosis, lamina 20-25 cm longa, 3-4.5 cm lata.

HOLOTYPE: Berrocal et al. 43, CR. Rio Segundo, Asunción, Prov. Limón, epifito. Elevación: 400-500 m. PARATYPE: Forest between Quebrada Quicuyal y Queb. Arrayanes, Cariblanco, Heredia, 900 m, R. Lent 3538 F, CR.

La nueva especie pertenece a la sección *Decorata* Mickel & Atehortua y su congénere más cercano es la que hasta ahora se consideraba la única especie de esa sección, *Elaphoglossum decoratum* (Kunze) Moore, del que difiere la nueva especie por no presentar escamas marginales, tener sólo las bases de la costa escamosas en ambas superficies la textura menos coriácea y las dimensiones generales de la planta y sus partes. Dedico esta especie, con especial cariño y arecio, a la Señora Lalita Signataro Granatta en su septuagésimo quinto cumpleaños y quien ha dedicado, desinteresadamente apoyo y hospitalidad a muchos botánicos visitantes y soportado, pacientemente, mis herborizaciones.

Elaphoglossum gerardianum L. D. Gómez sp. nov. rhizomate lignoso, condensato, 3.5-4 cm crasso, rosulato, squamis membranaceis pallide avellaneis vel cinnameis, 10-12 mm X 0.3-0.5 mm, integris, densissime vestito; stipitibus brevissimis, approximatis, subcylindricis,

squamis dorsaliter affixis, basim cucullato-denticulatis apicem filiformis, fusco-nigrescentibus dense obtectis, sterilibus 3-4 cm longis, 3-4 mm crassis, fertilibus 4-6 cm longis. Limbo sterili 35-45(50) cm longo, 5-7 cm lato, oblongo, pandurato, apicem retuso proliferans, basim angustato, rotundato-cordato, margine integerrimo, squamoso, squamis ferrugineis basim cucullato-expansis apicem aciculo-subulatis; superficie utraque glabra, nitida, costa crassa, subtus exserta, ad basim utrimque squamata, limbo fertili angustelanceolato, basim plus minusve decurrens, apicem acuminato. Venis ad costam 4-6/cm, patentibus, praesertim furcatis.

HOLOTYPE: Camino a Katsi, Cerro Kikirchabeta, Prov. Limón, 500 m, L.D. Gómez et al. 23784, CR. ISOTYPE: CR, MO. PARATYPE: 12-16 km above Panamerican Highway on road from El Llano to Carti-Tupile, 150-400 m, Panamá. H. Kennedy et al. 3138, CR, MO.

La nueva especie se caracteriza por su hábito nidular, recolectora de humus, sus frondes de gran tamaño y forma pandurada y por la presencia de yemas raquídeas, apicales, en los ápices retusos de los frondes estériles. Las escamas rizomáticas sugieren afinidad con algunas especies de la sección *Elaphoglossum* subsección *Pachyglossa* (e.g. *E. herminieri* (Bory & Fée) Moore) pero carece de filopodios. Por las escamas subuladas de costa y márgenes hay afinidad con especies de la sección *Polytrichia*. Una especie característicamente prolifera en Costa Rica es *E. proliferans* Max. & Morton ex Morton, de menores dimensiones, forma distinta y hábito diferente. Mickel (*Brittonia* 37(3):261-278. 1985), describe varias especies neotropicales proliferas, con base cordada *E. exsertipes* y *E. phyllitidis*, ambos de la sección *Undulata* pero largamente peciolados. Dedico esta nueva especie al amigo Gerardo Herrera Ch., generoso, entusiasta recolector, atento observador de la naturaleza, cuyos méritos no han sido reconocidos por aquellos llamados a hacerlo y a estimular a los valores nacionales. Sea este mi humilde tributo.

R. Singer et al. (Beihefte z. Nova Hedwigia, 77. 1983) citan como micosimbiontes potenciales en las tierras bajas neotropicales una *Astraeaceae*, *Astraeus hygrometricus*. Un ejemplar procedente de Turrialba, Cartago, 600 m (L. D. Gómez 22857, F) corresponde a esta especie que crece abundante en bosquecillos secundarios.

La esclerodermátacea *Scleroderma sinnamariense* Mont., indicada como pantropical por Guzmán (*Darwiniana* 16: 304. 1970) se registra ahora de dos localidades costarricenses: Bribri y La Selva de Sarapiquí, ambas vertiente caribe, Provincias de Limón y Heredia, respectivamente, creciendo bajo *Gnetum*. El peridio es achocolatado y no presenta tintes verdosos como el material amazónico, las demás características calzan con las dadas por Guzmán y Singer et al., L. D. Gómez 20560, F; Gómez s.n. Tulane Univ.).

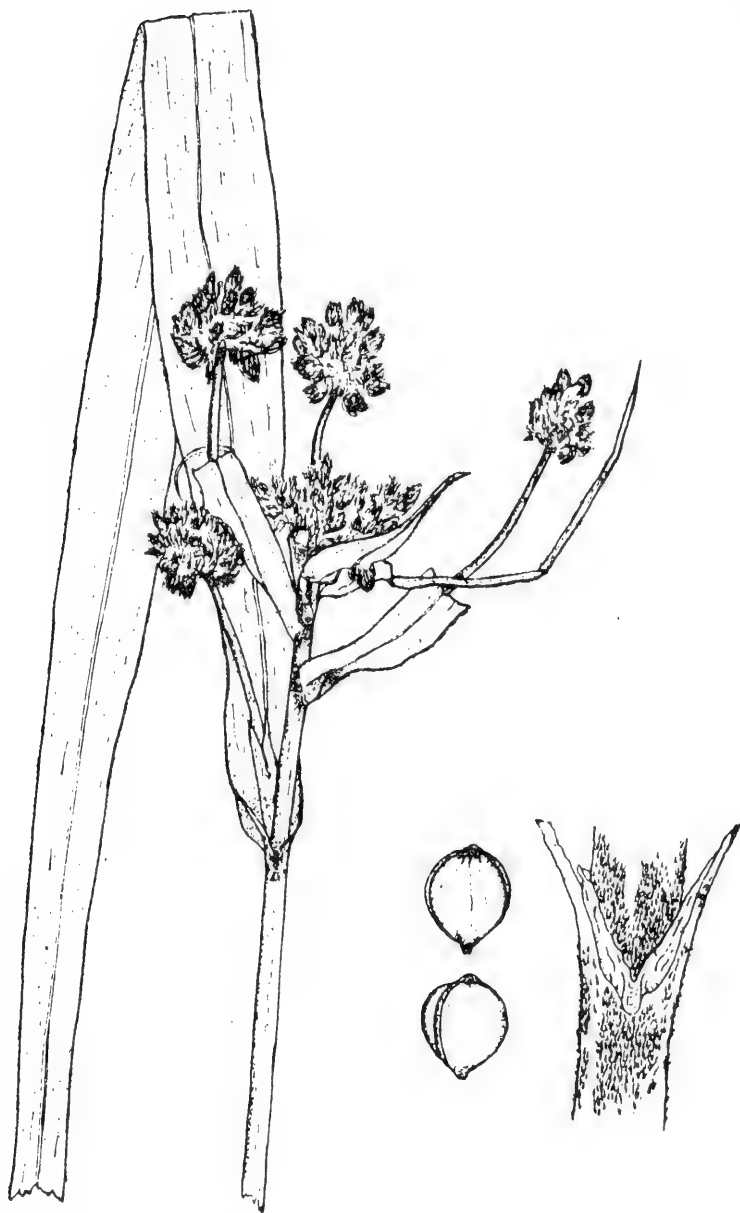


Fig. 1. *Mapania Herrerae* Gómez-L.

NOVELTIES AND NEW COMBINATIONS IN MACHAERANTHERA
(ASTERACEAE - ASTEREA)

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In connection with a forth-coming systematic treatment of the series Variabiles and Verae of the genus Machaeranthera (sensu Cronquist and Keck, 1957) the following novelties and new combinations are deemed appropriate.

MACHAERANTHERA ASTEROIDES var. GLANDULOSA B. L. Turner, var. nov.

M. a. var. asteroides accedens sed capitulis minoribus, phyllariis brevioribus, pilis paucioribus, et vestimento prominentibus trichomatibus glandularibus.

Resembling M. a. var. asteroides but differing in its smaller heads with shorter less pubescent involucre bracts and prominent vestiture of glandular trichomes.

TYPE: UNITED STATES. ARIZONA: Maricopa Co., 2.6 mi E of Queen Creek Tunnel, 4200 ft, 19 Sep 1975, Pinkava, Keil & Lehto LL8904 (holotype LL; isotypes ASU, CSU, NY).

The variety is abundant at lower elevations in central Arizona and grades into the var. asteroides southward. The latter is readily distinguished by its densely puberulent vestiture, larger heads with more numerous ray florets and generally broader leaves.

MACHAERANTHERA ASTEROIDES var. LAGUNENSIS (Keck) B. L. Turner, comb. nov.

based upon Machaeranthera lagunensis Keck, Brittonia 9: 238. 1957.

MACHAERANTHERA BIGELOVII var. COMMIXTA (Greene) B. L. Turner, comb. nov.

based upon Machaeranthera commixta Greene, Pittonia 4: 71. 1899.

MACHAERANTHERA CANESCENS var. AMBIGUA, B. L. Turner, var. nov.

M. c. var. canescens accedens sed capitulis magnioribus, phyllariis adpressis tantum pubescentibus, achaeniis saepe glabris.

Resembling M. c. var. canescens, but differing in its larger heads and appressed, merely pubescent, involucre bracts and mostly glabrous achenes.

TYPE: UNITED STATES. ARIZONA: Coconino Co., Flagstaff, 28 Aug 1922, H. Hanson A7 (holotype TEX; isotypes ARIZ, F, MO, NEB, NY, OSU, PHIL, RM, TEX).

Representative Specimens (from among 300 or more): UNITED STATES. ARIZONA: Apache Co.: 15 mi W Window Rock, 1 Sep 1962, Turner (TEX). Coconino Co.: E slopes San Francisco Peaks, 8000 ft, 27 Sep 1939, Cutler 3117 (DS, GH, MO, NDG, NY); E of Flagstaff, 4 Sep 1940, Heller 15795 (DS, MO, NY, PHIL, UC, US, WSU); 5 mi S Grand Canyon Natl. Park, highway 64, 11 Sep 1940, Heller 15821 (DS, MO, NY, PHIL, WSU); 10 mi W Flagstaff, 14 Aug 1946, Parker et al. 6158 (ARIZ, DS, LL, US, UTC); near Flagstaff, May-Oct 1900, Purpus 8096 (MO, POM, UC, US); Rowe's Well, Rim of Grand Canyon, 5 Nov 1899, Ward 10 (NY, RM, US). Navajo Co.: just W of Heber on road to Payson, 28 Aug 1973, Sexton s.n. (ASU). Yavapai Co.: 30 mi S Flagstaff, 19 Oct 1982, Neese 12508 (BYU, NY).

MACHAERANTHERA CANESCENS var. ARISTATA (Eastwood) B. L. Turner, comb. nov.

based upon Aster canescens var. aristatus Eastwood, Proc. Calif. Acad. Sci., Ser. 2, 6: 296. 1896.

MACHAERANTHERA CANESCENS var. NEBRASKANA, B. L. Turner, var. nov.

M. c. var. canescens accedens sed plantis altioribus erectioribus rigidioribus, involucris magnioribus 0.9-1.5 cm altis, phyllariis 8-9-seriatis, floribus radiatis saepe plurioribus.

Differing from M. c. var. canescens in being taller, more stiffly erect, with larger, 8-9 seriate, involucre (0.9-1.5 cm high) with generally more numerous ray florets.

TYPE: UNITED STATES. NEBRASKA: Sheridan Co.: 2 mi E Ellsworth, sandhill prairie on dry loose sand, 27 Aug 1968, Steve Stephens 28037 (holotype NY!; isotypes ARIZ!, DS!, GH!).

This taxon is largely confined to Nebraska and has been treated by some authors as M. sessiliflora, but the latter name applies to populations along the Snake River in Idaho, as noted below.

MACHAERANTHERA CANESCENS var. sessiliflora (Nutt.) B. L. Turner, comb. nov.

based upon Dieteria sessiliflora Nutt., Trans. Amer. Phil. Soc., Ser. 2, 7: 301. 1840.

The type of this heretofore problematical name was believed by at least a few authors to have been collected on the east slopes of the Rocky Mountains. My studies strongly suggest that type material was collected by Nuttall along the Snake River during his excursion to Oregon in 1836.

MACHAERANTHERA CANESCENS var. SHASTENSIS (A. Gray) B. L. Turner, comb. nov.

based upon Machaeranthera shastensis A. Gray, Proc. Amer. Acad. Arts 6: 539. 1865.

MACHAERANTHERA CANESCENS var. ZIEGLERI (Munz) B. L. Turner, comb. nov.

based upon Machaeranthera canescens subsp. zieglerei Munz, Aliso 7: 65. 1969.

In my treatment Machaeranthera canescens is composed of ten, largely allopatric, intergrading taxa which will be arranged in two or more subspecies.

LITERATURE CITED

Cronquist, A. and D. D. Keck. 1957. A reconstitution of the genus Machaeranthera. Brittonia 9: 231-239.

STUDIES IN THE EUPATORIEAE (ASTERACEAE) CCXXII.

NEW COMBINATIONS AND NEW SPECIES FROM

TROPICAL AMERICA.

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A careful review of the literature shows the need for the following new combinations in the Eupatorieae. The occasion is also taken to describe three new species that have been encountered in collections sent for identification.

AGERATINA ASCLEPIADEA (L.f.) R. M. King & H. Robinson, comb. nov. Cacalia asclepiadea L.f., Suppl. Pl. 352. 1781. Colombia. The species name by Linneaus f. displaces the familiar Ageratina angustifolia (H.B.K.) K. & R.

AGERATINA GRANDIFOLIA (Regel) R. M. King & H. Robinson, comb. nov. Eupatorium grandifolium Regel, Gartenflora 1: 102. pl. 12. 1852. Mexico. The original basionym of Ageratina conspicua (Kunth & Bouche) K. & R. is a later homonym and the species name was not validated until its transfer to Kystenina by E. L. Greene. The validation was after the description of Regel's species.

DASYCONDYLUS HIRSUTISSIMUS (Baker) R. M. King & H. Robinson, comb. nov. Eupatorium hirsutissimum Baker, Fl. Bras. 6(2): 311. 1876. Brazil. This is evidently the same species more recently described as Dasycondylus santosii K. & R.

DISYNAPHIA TACUAREMBENSIS (Hieron. & Arechav.) R. M. King & H. Robinson, comb. nov. Eupatorium tacuarembense Hieron. & Arechav. in Arechav., Anales Mus. Nac. Montevideo ser. 2. 1: 8. pl. 1. 1904.

PHANEROSTYLIS HINTONIORUM (B. Turner) R. M. King & H. Robinson, comb. nov. Brickellia hintoniorum B. Turner, Phytologia 58(7): 193. 1985. The species is transferred on the basis of the description and comments of the author. Material has not been

available for study.

FLEISCHMANNIA HARLINGII R. M. King & H. Robinson, sp. nov.

Plantae herbaceae perennes ad 0.5 m altae paucè ramosae. Caules angusti teretes leniter striati rubescentes superne minute sparse puberuli inferne glabrescentes. Folia opposita, petiolis tenuis 6-15 mm longis; laminae ovatae vel triangulares plerumque 1.2-2.8 cm longae et 0.7-1.4 cm latae base breviter obtusae vel subtruncatae margine lateraliter argute serratae apice leviter anguste acuminatae supra sparse pilosulae et glanduliferae subtus vix glandulo-punctatae in nervis et nervulis sparse puberulae. Inflorescentiae terminales paucè ascendenter ramosae, ramis ultimis 7-11 mm longis sparse minute puberulis, bracteis subulatis erecto-patentibus. Capitula campanulata ca. 9 mm alta et 6-7 mm lata; squamae involucri ca. 20 subimbricatae lanceolatae vel lineares 3-7 mm longae et 0.8-1.5 mm latae exteriores argute acuminatae interiores obtusae vel mucronulatae et leniter rubrescentes omnino extus subglabrae. Flores ca. 20 in capitulo; corollae albae ca. 4 mm longae, tubis ca. 1 mm longis, faucibus anguste infundibularibus ca. 2.5 mm longis, lobis oblongo-ovatis ca. 0.7 mm longis et latis extus sparse puberulis; filamenta in partibus superioribus ca. 0.3 mm longa; thecae ca. 1.2 mm longae, appendices antherarum oblongae ca. 0.3 mm longae et 0.25 mm latae; rami stylorum late lineari-spathulati. Achaenia ca. 2.5 mm longa in costis persistentiter flavescentia; setae pappi ca. 30 vix contiguae plerumque 3.0-3.5 mm longae apice tenues. Grana pollinis in diametro ca. 20 μ m.

TYPE: ECUADOR: Loja: Estribaciones de Celica, c. 3 km NE Guachanamá, 2800 m, dry secondary scrub. Flowers white. 21 Feb. 1985. G. Harling & L. Anderson 22347 (Holotype, GB).

Vegetatively the new species seems closest to Fleischmannia pastazae (B.L.Robinson) K. & R. of southern Ecuador, but the leaves have very few glands below (less than on the upper surface), and the inflorescence has fewer and larger heads on more ascending branches. Also, the style branches are broader and spathulate, and the achenes have persistently yellow costae. In their size the heads are more like F. obscurifolia (Hieron.) K. & R. of central Ecuador, but that is a more pubescent species with larger less serrate leaves having distinctly punctate undersurfaces, more corymbose inflorescences, larger involucre bracts with characteristically undulate scarious margins, bluish to lavender corollas, nar-

rower style branches, and more glabrous achenes.

MIKANIA HARLINGII R. M. King & H. Robinson, sp. nov.

Plantae volubiles recto-patentiter ramosae.

Caules fistulosi teretes leviter striati dense hirsuti vel sublanuginosi. Folia opposita, petiolis 5-8 mm longis; laminae subcoriaceae late ellipticae plerumque 3.0-4.5 cm longae et 2.0-3.3 cm latae base breviter obtusae vel rotundatae margine leviter reflexae sensim subcrenulatae apice late rotundatae supra sparse pilosulae in nervis majoribus depressae et anguste exsulcae subtus dense hirtellae in nervis et nervulis profunde exsulco-reticulatae, nervis majoribus in partibus basilaribus in binis duplicibus pinnatis sensim valde ascendenter curvatis. Inflorescentiae in ramis terminales pyramidaliter thyrsoidae, ramulis penultimis 2-7 mm longis dense hirtellis, aggregatis sessilibus 2-4-capitatis. Capitula ca. 6 mm alta; squamae involucris 4 oblongae ca. 4 mm longae et 1 mm latae apice rotundatae exteriores extus dense pilosulae. Flores 4 in capitulo; corollae sordide albae ca. 4 mm longae glabrae, tubis ca. 2 mm longis, faucibus indistinctis ca. 0.5 mm longis, lobis lanceolatis ca. 2 mm longis et 0.6 mm latis intus et extus laevibus; filamenta in partibus superioribus ca. 0.25 mm longa; thecae ca. 1 mm longae; appendices antherarum oblongae ca. 0.3 mm longae et 0.2 mm latae; basi stylorum glabri incrassati sed non noduliferi; rami stylorum breviter mamilliosi. Achaenia ca. 2.8 mm longa 5-costata plerumque glabra apice dense puberula; setae pappi ca. 45 longiores ca. 3.5 mm longae et in apicem clavatae breviores interspersae ca. 2.5 mm longae et in apicem attenuatae. Grana pollinis in diametro ca. 23 μ m.

TYPE: ECUADOR: Loja: Loma de Loro, 6 km S of Saraguro on road to Loja, 3200 m, moist montane scrub. Liana. Flowers dirty white, fragrant. 11 Feb. 1985. G. Harling & L. Andersson 21922 (Holotype, GB; isotype, US). PARATYPES: ECUADOR: Zamora-Chinchipec: Loja - Zamora road at the pass, 2900 m, wet scrub. Liana. Flowers dirty white. 12 Feb. 1985. G. Harling & L. Andersson 21982 (GB, US); CAFAR: At pass on road Pindilig - Rivera ("La Virgen"), 3200 m, secondary scrub. Liana, c. 2 m above ground. Flowers dirty-white. 9 March 1985. G. Harling & L. Andersson 22975 (GB).

The new species is obviously related to others with thyrsoid inflorescences in spite of the tendency for heads to group in threes. Relationship may be to such species as Mikania aschersonii Hieron., M. stuebelii Hieron., and M. sylvatica Klatt, but the

latter all have less pubescence, more pointed leaves, and have corolla throats as long or longer than the corolla lobes. The discovery of a new species in three different localities where it has not been seen before, raises interesting questions. Two of the localities have been commonly cited by past collectors. Geographically all three localities are in a series from eastern Cañar to the eastern Loja border area, in the eastern range of the Ecuadorian Andes. It must be assumed that the species will be found also in intervening eastern Azuay. The seeming sudden appearance of the species is probably associated with the great disturbance in vegetation noted in southern Ecuador in recent years.

NEOCUATRECASIA CUZCOENSIS R. M. King & H. Robinson,
sp. nov.

Plantae herbaceae perennes vel suffrutescentes erectae vel decumbentes ad 40 cm altae inferne ramosae. Caules teretes dense fulvo-hirtelli. Folia opposita breviter petiolata, petiolis 2-3 mm longis; laminae ovatae 10-12 mm longae 4-7 mm latae base rotundatae trinervatae margine pauce serratae apice acutae supra pilosulae subtus pallidiores dense punctato-glanduliferae in nervis dense pilosulae. Inflorescentiae terminales laxae cormbosae, ramis ultimis 3-12 mm longis dense patentiter puberulis. Capitula late campanulata ca. 7 mm alta et 7-8 mm lata, squamae involucri ca. 14 eximbricatae oblongae apice breviter obtusae 4-6 mm longae exteriores ad 2 mm latae extus dense puberulae interiores angustiores lineares 0.5-1.0 mm latae subglabrae. Flores ca. 20 in capitulo; corollae albae ca. 4 mm longae, tubis constrictis ca. 1 mm longis extus glanduliferis per-pauce minute spiculiferis; faucibus campanulatis cylindricis ca. 2 mm longis intus superne mamillosis, lobis oblongo-ovatis ca. 1 mm longis et 0.7 mm latis extus dense glandulo-punctatis et interdum breviter uni-setuliferis intus dense papillosis; filamenta antherarum in partibus superioribus ca. 0.3 mm longa in parietibus cellularum dense annulate ornata; thecae ca. 0.8-0.9 mm longae; appendices antherarum subquadrate ca. 0.2 mm longae et latae; basi stylorum solum dense hispiduli; scapi stylorum glabri; rami stylorum late lineares laminiiformes utrinque dense papillosi. Achaenia ca. 2.2 mm longa base breviter attenuata in costis dense breviter setulifera; setae pappi ca. 35 persistentes ca. 2 mm longae irregulariter scabridulae apice tenuiores acute. Grana pollinis in diametro 23-25 μ m.

TYPE: PERU: Cuzco: Prov. Paucartambo. 7 to 12 km

from Acyanaco Pass on road to Tres Creces. Elev. ca. 3700 m. 13°07'S, 71°40'W. Polylepis and Weinmannia woodland mixed with Stipa ichu grassland. Scrambling herb; flowers white. 4 April 1985. Bruce Stein 2481 (Holotype US; Isotype, MO).

The Paucartambo area of Cuzco seems to be one of the centers of diversity for the small Peruvian and Bolivian genus Neocuatrecasia. The present species differs from all others in the genus by having less hairs on the corolla lobes. It differs of N. mancoana and N. hirtella of the same province by the short restricted area of pubescence at the base of the style. From the first of the above it differs further by the longer pappus, and from the second it differs further by the less attenuate achene base and the leaf blades without truncate to subcordate bases. Of species having similar restricted pubescence on the style, N. weddellii of Carabaya, Peru has larger heads with more flowers, and N. thymifolium of Bolivia has simpler leaves, more abrupt bases on the corolla throats, and longer more irregular setulae above on the ribs of the achenes.



NEOCUATRECASIA

CUZCOENSIS

NEOCUATRECASIA

Neocuatrecasia cuzcoensis R.M.King & H.Robinson,
Holotype, United States National Herbarium. Photos by
Victor E. Krantz, Staff Photographer, National Museum
of Natural History.



Neocuatrecuria cuzcoensis enlargement of heads.

BOOK REVIEWS

Alma L. Moldenke

LE GENRE *INGA* (Légumineuses, *MIMOSOIDEAE*) EN GUYANE FRANÇAISE: Systematique, Morphologie des Formes Juvéniles, Ecologie" by Odile Poncy in *Mémoires du Muséum National d'Histoire Naturelle*, series B.31, 153 pp., 37 b/w multi-fig., 11 multi-photo. pl., 2 geog. distrib. maps & 2 tab. Paris 75005. 1985. 218.40 francs.

This carefully prepared presentation is no. 13 in the "Studies on the Flora of the Guianas". Of the "more than 35 species known" here, 34 are keyed according to their indehiscent unique sacrotestate fruits and juvenile forms of 22 are keyed according to details of the compound leaf structure. One table is systematic - according to Bentham (1875), León (1966) and others; another is for habitats - primary or climax forests, diversified forests and cleared or savanna zones. After biogeographical notes and anatomical description of the genus as a whole, the individual species are systematically and fully described in the usual taxonomic form. This very study will surely be of interest to many botany and ecology students and scholars.

THE FACTS ON FILE DICTIONARY OF ASTRONOMY Revised Edition" edited by Valerie Illingworth, 437 pp., 85 b/w illus. & diag. & 27 tab. Macmillan Press, U. K. 1985 & Facts on File, Inc., New York, N. Y. 10016. 1986. \$19.95.

Updating that involves new and revised concepts since the 1979 first edition especially about different types of celestial bodies and the new and improved instruments making these investigations possible, the increased public awareness due to the arrival of Halley's comet, the clear explanations with ample cross-referencing, and the effective diagrams make this book a valuable study source for all English-reading amateur, student and professional "star gazers".

INSTRUMENTATION FOR ENVIRONMENTAL PHYSIOLOGY" edited by B. Marshall & F. I. Woodward, x & 242 pp., 56 b/w fig. incl. 2 photo. & 26 tab. Cambridge University Press, Cambridge, London & New York, N. Y. 10022. 1986. \$34.50.

This book is number 22 in the Seminar Series of the Society for Experimental Biology. It describes evaluatively in its 13 chapters by 17 scientists the most effective improvements in instrumentation that have been made for measuring and recording data from research stations involving radiation, in air, H₂O vapor, temperature, wind speed, recording of remote sites, microprocessing, porometry, plant water potentials, growth and structure. The last chapter discusses the role of these "tools of science" and the in-

strumenters who invent and modify them. Along with the references two U. K. and two U. S. manufacturers are listed. This updating will prove valuable not only for the scientists in the labs but also for teachers in the classroom whose own "lab" days employed earlier techniques and equipment.

"ECOLOGY OF AN OAK FOREST IN HUNGARY - Results of Sikfökt Project 1, Structure, Primary Production and Mineral Cycling" edited by P. Jakucs, xiv & 546 pp., hundreds of detailed diagrams, maps & tables & 16 photo pl. Akademiai Kiadó, P. O. B. 24, Budapest H-1363 Hungary. 1985. \$49.00.

This is an important, very detailed I. B. P. report starting with careful ecological observational descriptions and measurements as early as 1972 of what is mainly a temperate climax *Quercus petraea* and *Q. cerris* temperate zone oak forest and surrounding more varied (by many environmental factors such as different elevations, vegetation, man, soil chemistry) areas. This Sikfökt is located near Eger in northern Hungary. The separately authored chapters deal with such topics as photomass, growth and pigment investigations, energy content of autotrophic parts of the forest, nutrient content, and element migration and litter decomposition. The copious charts, diagrams and tables are helpfully well constructed. Since this study is the first published, it sets very high standards to be at least met by the future publications. This study is recommended worldwide and so it is fortunate that it is written in English.

"A FLORA OF SAN DIEGO COUNTY, CALIFORNIA" by R. Mitchel Beauchamp, ii & 241 pp. & 8 b/w geogr. distrib. area maps. Sweetwater River Press, P. O. Box 985, National City, California 92050. 1986. \$22.95 soft cover & \$28.95 hard cover.

For this southern California area our author-friend claims that no other county within the continental United States has a larger number of native plant taxa. Even the botanists attached to the early western expeditions made similar claims. Several floras of this area have been authored by outstanding California botanists but these are now all out of print. This present work is arranged phylogenetically to class level and from there on alphabetically. Included with my review copy is a fine vegetation map run on protectively covered paper. This is an extra for \$2.25, but the text contains its own separate pages of the 8 sectional maps. This book should prove 'time and energy efficient' for folks - naturalists, ecologists, students and teachers - on local "hunts".

PHYTOLOGIA

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DESMANTHUS BALSSENSIS (LEGUMINOSAE: MIMOSOIDEAE), UNA

ESPECIE NUEVA DE LA DEPRESION DEL RIO BALSAS EN

GUERRERO, MEXICO.

José Luis Contreras Jiménez

Herbario de la Facultad de Ciencias, UNAM
A.P. 70-399, Coyoacan C.P. 04510 Mexico D.F.

Desmanthus balsensis J.L. Contreras sp. nov., fig. 1.

Frutex 1-3 m altus; ramuli geniculati. Folia 1.3-2.1 (-3.3) cm longa. Capitula floribus inferioribus masculis vel superioribus hermaphroditis vel totis masculis vel neutris; antherae glandula stipitata caduca coronatae; pollen in tetratibus tetraedricis. Legumen 2-8.2 cm longum, 0.5-0.7 cm latum, valvis coriaceis.

Arbusto de 1-3.5 m. de alto; corteza lisa de color marron oscuro y grisáceo; ramillas geniculadas, glabras, con abundantes lenticelas. Hojas bipinnadas, dispuestas en ramas cortas; estipulas linear-subuladas, setosas, de 1-4 mm de largo, persistentes; peciolo angulosos o redondeados, acanalados, pilosos o glabros, de 5-10 (-15) mm de largo; raquis anguloso, acanalado, piloso o glabro, de (4-) 8-11 (-18) mm de largo, terminado en una seta de 0.5-2.5 mm de largo, con una glándula crateriforme entre el primer par de pinnas, en ocasiones tambien en el segundo par, o las glándulas ausentes; pinnas en 1-4 pares, de 7-15 (-20) mm de largo; foliolos en (5-) 8-10 (-14) pares, oblongos, de 1.5-5 mm de largo por 0.5-1.6 mm de ancho, base oblicua, ápice agudo, mucronulado, margen entero, ciliado o glabro. Inflorescencias de capítulos ovoides sobre pedúnculos 3-4 angulados, de 1-3.5 cm de largo, solitarios o pareados en las axilas de las hojas; brácteas semejantes a las estipulas; bracteolas acinaciformes, de 1-2.5 mm de largo, persistentes. Capítulos con las flores inferiores estaminadas, y las superiores perfectas, o en ocasiones todas las flores estaminadas o neutras; cáliz campanulado, de 1.4-2.7 mm de largo, con 5 lóbulos triangulares a deltados, de 1/4 a 1/3 de la longitud del tubo, glabros; corola con 5 pétalos libres, blancos a verde claro, angostamente trulados a lanceolados, de 2-3.5 mm de largo, glabros; estambres 10, filamentos delgados, libres, de diferente longitud, los mas largos de 3.5-5.5 mm exsertos, los mas cortos insertos en la corola; anteras dorsifijas, oblongo-ovadas, de 0.4-0.6 mm de largo, coronadas con una glandula estipitada

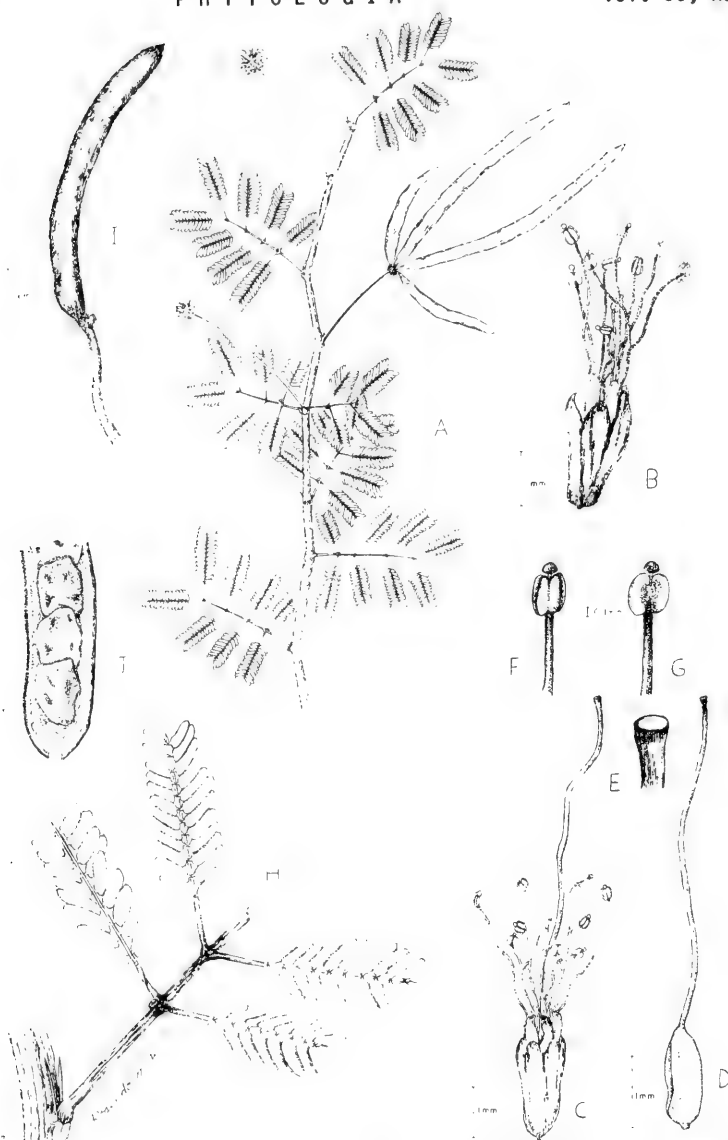


Fig. 1 *Desmanthus balsensis* J.L. Contreras. A rama con capítulos y frutos inmaduros; B flor masculina; C flor femenina; D pistilo; E estigma; F,G antera glandular, vista ventral y dorsal respectivamente; H detalle de una hoja mostrando nectario y estipulas; I fruto maduro; J semillas dentro del fruto.

caduca; polen en tetradas tetraedricas, de 52.6-62.5 μ m de diametro; ovario subsésil, de 1-1.5 mm de largo, glabro; estilo filiforme, de 3.5-6 mm de largo, excediendo la longitud de los estambres; estigma terminal, concavo; ovulos 11-14. Calices de las flores estaminadas de 1.1-2.2 mm de largo, estambres 10-12, los demas caracteres semejantes a los de las flores perfectas. Flores neutras mas pequeñas que las anteriores, con 1-5 pétalos; estambres reducidos a filamentos de menos de 0.5 mm largo, en ocasiones algunos bien desarrollados pero sin antera. Legumbre sésil, subcilindrica, linear, recta, curva o falcada, de (2-) 3.6-5.5 (-8.2) cm de largo por 0.5-0.7 cm de ancho, valvas coriáceas de color marrón obscuro al madurar, base obtusa, apice agudo, dehiscente a lo largo de ambas suturas. Semillas 2-13, dispuestas longitudinalmente respecto a las valvas, subcomprimidas, elipsoidales, oblongas u ovoides, de 4.4-6.5 mm de largo por 3-4.5 mm de ancho, de color pardo a verde-grisáceo.

Tipo: Mexico, Guerrero; Municipio de Zumpango del Rio, 4 km al Este-Noreste de Xochipala, 7 de Noviembre de 1985, J. Luis Contreras J. 1737 (Holotipo, FCME; isotipo, MEXU; otros isotipos para ser distribuidos). Otros ejemplares examinados: Mexico, Guerrero; Municipio de Zumpango del Rio 2.5 km al Este-Noreste de Xochipala, 14 de Julio de 1985, J. Luis Contreras J. 1143 (FCME); 1145 (FCME, MEXU); 3.5 km al Este de Xochipala, 22 de Agosto de 1985, J. Jiménez Ramírez 445 (FCME); 448 (FCME); 4 km al Este-Noreste de Xochipala, 7 de Noviembre de 1985, J. Luis Contreras J. 1742 (FCME, MEXU); 6 km al Noreste de Xochipala, 7 de Septiembre de 1980, J. Luis Contreras J. 569 (FCME); 10 km sobre la carretera Mezcala-Chilpancingo, 10 de Septiembre de 1980, L. Soto Pinto 336 (FCME); Municipio de Copalillo, cerro al Oeste de Tlalcozotitlan, 9 de Junio de 1982, A. González Monzón 12 (FCME).

Desmanthus balsensis se caracteriza por su habito arbustivo, ramillas geniculadas, anteras glandulares, polen en tetradas, y legumbre subcilindrica con las valvas coriáceas. Características que la distinguen del resto de las especies conocidas del genero cf. Britton & Rose (1923), Rudd (1960), Turner (1950). El hábito de esta especie es similar al de D. fruticosus, y D. covillei, pero se diferencia de ambas por sus hojas de menor tamaño, con foliolos más pequeños, y menos numerosos.

Desmanthus balsensis es la única especie conocida del genero con anteras glandulares caracter que la relaciona con el genero Neptunia, sin embargo las estipulas subuladas, el fruto sésil con las semillas transversales son características propias del genero Desmanthus (Windler, 1966). Asi, D.

balsensis posee caracteres intermedios entre estos dos géneros, hecho que refuerza la opinión de Isely (1970) en el sentido de que *Desmanthus* y *Neptunia* podrían considerarse como secciones de un mismo género.

La presencia de granos de polen en tetradas es un carácter que no se había reportado para estos dos géneros, por lo que se requiere de estudios más detallados para entender su significado.

Desmanthus balsensis se ha colectado únicamente en un área restringida de la porción guerrerense de la Depresión del Río Balsas, en laderas con suelos calizos de la Formación Mezcala, entre los 650 y 1100 msnm, en el bosque tropical caducifolio, asociado a *Bursera* spp., *Neobuxbaumia mezcalaensis*, *Bauhinia andrieuxii*, *Acacia velvae*, entre otras especies.

AGRADECIMIENTOS

Quiero manifestar mi agradecimiento al M. en C. Mario Sousa, al Dr. Alfonso Delgado, y al Biol. Jaime Jiménez por la revisión crítica del manuscrito, y sus acertados comentarios y sugerencias; al Dr. Fernando Chiang por la diagnosis latina; así como al Sr. Rosendo Martínez por la ilustración que acompaña a la descripción.

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A NEW SPECIES OF MACHAERIUM (LEGUMINOSAE) FROM NICARAGUA

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Collection of additional specimens for the Flora de Nicaragua has further complicated the understanding of an otherwise difficult group of Machaerium ranging from México to Colombia and Venezuela. The complex includes species such as M. arboreum (Jacq.) Vog., M. acuminatum H.B.K., M. pittieri Macbr. (M. acuminatum var. latifolium Benth.), M. chiapense Brandeg., and others. Delimitation of the type specimens is relatively easy, chiefly on the basis of the fruit, but other collections show intermediate characters. The flowers and leaves are mostly similar. Apparently no studies have been made to determine what ecological, especially edaphic, characters might be contributory to the distribution of the various taxa.

Two species of what may be called the M. arboreum complex occur in Nicaragua. One, M. pittieri Macbr. (Field Mus. Bot. 4: 91. 1925), has been lectotypified by Oersted 7 (K), Nicaragua, "inter Granada et Nicaragua", in 1837 (Kudd, Bol. Soc. Bot. Méx., no. 37: 144. 1977). It was based on M. acuminatum H.B.K. var. latifolium Benth. (Jour. Linn. Soc. Bot. 4, suppl.: 65. 1860), later raised to specific status as M. latifolium (Benth.) Pittier (Contr. U. S. Nat. Herb. 20: 470. 1922), non Rusby 1910. In addition to "Nicaragua, Oersted", Bentham cited "Xalapa, Galeotti; Mount Orizaba, Broteri, n. 1021", both collections from Veracruz, México. Pittier based his observations on a collection from Costa Rica, "A. Tonzuz (Inst. Fís. Geogr. Costa Rica, no. 10069). All of those specimens are more or less similar and, for the time being, at least, are being treated as conspecific.

In Nicaragua there is what appears to be a second, related species, here described as new. It is chiefly distinguished by its larger, tomentulose fruit.

MACHAERIUM NICARAGUENSE Kudd, sp. nov.

A speciebus affinis, M. arboreum Jacq., M. acuminatum H.B.K., M. pittieri Macbr., etc., fructibus majoribus, tomentulosis imprimis distinguendum.

Arbores ad fere 10 m altae, inermes; stipulae deltoideae, glabrae, leviter induratae, subsistentes vel caducae, 1-5 mm longae; folia 3-5-foliolata; foliola ovata ad lanceolato-ovata, subcoriacea, fere (3.5-) 6-16 cm longa, (1.5-) 2.5-7.5 cm lata, acuta ad leviter acuminata, acumene 0.5-2 cm longo, basi rotundato usque ad cuneato, supra glabra, subtus glabra vel subglabra, venulis irregulariter reticulatis, plerumque non prominulis;

inflorescentiae axillares, racemosae vel paniculatae, tomentulosae; flores 6-8 mm longi, sessiles, calyce 2-3 mm longo, 1.5 mm diametro, striato, puberulento, petalis albis, fere in siccate nigricans, vexillo pubescenti; fructus alatus, fere rectus, plerumque subcultriformis, (6-) 8-13 cm longus cum stipite 3-7 (-10) mm longo, parte seminifera 2-3.5 cm longa, 2-3 cm lata, ala circiter (4-) 5-10 cm longa, (2-) 3-3.8 cm lata, demum plus minusve glabrescente.

Type: W. D. Stevens 16329, Nicaragua, Depto. de Madriz, lower W slope of Cerro Volcán de Somoto; ca 13° 25' N, 86° 35' W, elev 900-1300 m; pastures below and disturbed deciduous forest above, 13 Dec. 1979, in fruit (holotype MO, no. 3294008; isotype SFV).

Additional collections:

Nicaragua: Depto. de Nuevo Segovia: El Jícaro, "Las Animas", elev. 750-800 m, Moreno 12932 (MO). El Jícaro, "Quebrada Grande", elev. 700-750 m, Moreno 13918 (MO, SFV). "Las Gallineras", 2 km de Murra, orilla de Quebrada La Mula, elev. ca 760-800 m, Moreno 5891 (MO, SFV). La Tronquera, elev. 660-700 m, Moreno 19459 (MO). Quebrada El Mancital, ca km 233.5, ca 6.2 km N of edge of Ocotal, mixed evergreen and deciduous forest in quebrada, cutover pine forest on slopes and ridge, elev. 700-760 m, Stevens 3036 (MO, SFV). Depto. de Madriz: Cerro Quisuca, summit and upper slopes, steep rocky slopes, elev. 1100-1250 m, Stevens 16037 (MO, SFV). S of Somoto, between Santa Teresa and El Rodeo, heavily grazed oak forest on rocky slopes, elev. 800-900 m, Stevens 22221 (MO, SFV). Depto. de Esteli: Mun. San Juan de Limay, valle Las Cascadas, elev. 800-900 m, Moreno 1930 (MO, SFV).

Honduras: Depto. de Morazán: Region of río de la Orilla, SE of El Zamorano, rocky wooded river bank, elev. 900-950 m, Standley 25806 (NY). Near Suyapa, along Quebrada Suyapa, in barranco, elev. 1100 m, Molina 578 (MO). Depto. de Paraíso: Matorrales del río Mata Indo, entre San Francisco y Lizapa, elev. 900 m, Molina 14448 (NY), 14452 (NY). Jamastrán Valley, Hacienda Quebrada Seca, elev. 500 m, Molina 20310 (NY). Depto. de Ocotepeque: Vicinity of San Antonio, cutover pine-oak forest El Cerro, elev. 1300 m, Molina 22474 (MO, NY).

MISTAKEN IDENTITY IN ANNUAL *ERAGROSTIS* (GRAMINEAE)

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The large number of incorrectly identified specimens of annual *Eragrostis* in herbaria attest to the fact that this group has been a persistent source of taxonomic difficulty. Recent studies, however, particularly those of Koch (1974, 1985), have added greatly to our understanding of several of these puzzling species.

Examination of old vouchers on which certain state records were based has revealed several cases of mistaken identity. As a result, it is now evident that *Eragrostis barrelieri* should be added, and *E. minor* deleted for Wyoming; neither *E. minor* nor *E. frankii* appears to occur in Arizona. I am grateful to the curators at ASC, ASU, and RM for the loan of specimens.

WYOMING

Porter (1964) includes *Eragrostis poaeoides* P. Beauv. ex Roem. & Schult. (= *E. minor* Host) as part of the grass flora of Wyoming. His note indicates a single collection from the University campus at Laramie. This record is clearly based on the following: Albany Co., Laramie, Univ. of Wyoming campus, 7200 ft, weed in dry soil, waste ground, 23 Aug 1957, C. L. Porter 7430 (ARIZ, RM). The RM specimen apparently served also as the basis for the inclusion of *E. poaeoides* by Beetle & May (1971).

The above collection, in fact, represents *Eragrostis barrelieri* Daveau, a species not previously reported from the State. Two additional gatherings of this latter species from Wyoming are at RM, both are from Laramie: N 7th St. between Lewis and Bradley, weed in garden, 1 Oct 1975, B. E. Nelson & L. Nelson 1440 [determined as *Eragrostis minor* Host]; Parking lot corner of 11th St. and Grand Avenue, 7 Aug 1982, G. P. Hallsten 360 [determined as *E. pectinacea* (Michx.) Nees].

Porter's 1957 collection was apparently the first from Wyoming of this introduced European weed. It was almost two decades before it was collected again, and today seems to be known in the State by only three gatherings, all from within the city limits of Laramie. The first two collections were determined as *Eragrostis minor* (syn. = *E. poaeoides*); the most recent specimen was also misidentified, but as *E. pectinacea*, another weedy species represented at RM by several collections from the southeastern part of Wyoming.

Hitchcock (1951) gives the U.S. range for *Eragrostis barrelieri* as "Colorado and Kansas to Texas and California." The species is not listed by Cronquist, et al (1977).

Difficulties in determining *Eragrostis barrelieri* and its confusion with *E. minor* are understandable. The key in Hitchcock's Manual is quite confusing in that it indicates that in *E. barrelieri* the plants are not glandular on the branches nor lemmas, and

that the panicles are narrow. Harvey (1975), in contrast, states correctly that the panicle is open and that the branches frequently have glandular spots or rings. In my experience, the most consistent character which serves to distinguish *E. barrelieri* from its closest allies is the presence of glandular areas or rings on the rachis below the branches. These seem always to be present, and are often large, shining, and quite conspicuous. Frequently they are yellowish.

Regarding *Eragrostis minor* in Wyoming, as indicated above, the Porter and Nelson collections so-named actually represent *E. barrelieri*. A third collection from Wyoming at RM originally determined as *E. minor* (Goshen Co., T26N, R64W, SW29, sandy road bed, 4266 ft, 9 July 1982, Hallsten, Skinner, & Beetle 122) is, in reality, a small plant of *E. cilianensis* (All.) Vign.-Lutati ex Janchen, a not uncommon weed in Wyoming. Many of the lemmas on the above specimen have prominent glands on their keels. In *E. minor* glands are mostly on panicle branches and pedicels, but may also occur on margins of blade and keel of sheath. Glands are normally rare (or absent) on the lemmas. Since all collections from Wyoming determined as *E. minor* prove to be misidentifications, the name of this species should be omitted from any list of grass taxa occurring in the state.

ARIZONA

Two cases of mistaken identity involving annual *Eragrostis* taxa have come to my attention recently. One is the report of *E. poaeoides* P. Beauv. ex Roem. & Schult. (= *E. minor* Host) by Pinkava, et al. (1970). One collection is cited: Navajo Co., 4 miles E of Heber, 12 Oct 1963, E. Lehto & D. Keil 3534. I have examined the ASU specimens of this collection, and a duplicate at ARIZ, and the plants are clearly *E. mexicana* (Hornem.) Link. Although this species and *E. minor* are similar in many respects, the caryopses are quite different. The grain of *E. mexicana* is blunt at the apex, somewhat cubical in shape, and bears a well defined groove on the side opposite the embryo. In *E. minor* in contrast, the caryopsis is rounded at the apex, the general shape is ellipsoidal, and there is no longitudinal groove.

Curiously, although *Eragrostis minor* is not listed as part of the Arizona grass flora by Harvey (1951), a specimen at ARIZ (G. M. Davis s.n. S.C.S. 4555, collected in 1936 near Prescott, Yavapai Co.) bears an annotation by Harvey as *E. poaeoides*, and the date 12/IV/40. The specimen is somewhat immature and does not have mature caryopses, but it appears to represent *E. mexicana*. Another specimen at ARIZ labeled *E. poaeoides* (Hardies 967, collected in 1936 in Oak Creek Canyon) is clearly *E. mexicana*. The grains are mature and have the characteristic shape and distinctive groove.

Eragrostis frankii C. A. Meyer was reported from Arizona by Rominger, et al. (1984). The specimen cited is: Yavapai Co., SE $\frac{1}{4}$ Sec. 27, T16N, R4E, Cornville Quad., ca. 3400 [ft], C. Jeffers s.n., Aug 1979. (DHA 39486). [The international acronym for the Deaver

Herbarium at Flagstaff is ASC, not DHA! see Index Herbariorum.]. We have received on loan from ASC two specimens of the above collection. Both are very immature, the panicles only partially emerged from the upper sheath, but they seem clearly to represent *E. cilianensis* (All.) Vign.-Lutati ex Janchen. Even though immature, the specimens are some 30 cm tall and rather coarse. Some of the glumes and lemmas bear on their keels prominent circular glands characteristic of *E. cilianensis*.

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MICROPOMA NILOTICUM (DEL.) LINDB. (MUSCI)

WITH CORM-LIKE STEM BASES

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During excursions by the authors, aimed at a study of the algal-moss association in various parts of Egypt, six samples of the moss Micropoma niloticum (Funariaceae) were collected. This moss is not common but is wide spread on muddy banks of the Nile, irrigation canals, and fields in late winter and early spring months (see : Delile, 1812; Imam and Ghabbour, 1972; El-Saadawi and Abou El-Kheir, 1973; Refai, 1985). It is also known from Ghazza Strip (El-Saadawi, 1972). It grows usually as pure stands in a pH range of 6.5 to 8 (Darwish, 1984) sometimes in association with Riccia sp. (Hepaticae). Sporophytes readily develop and reproduction is mainly by spores; no gemmae have, hitherto, been found.

One of the six samples was collected from a canal bank at El-Ghareeb village in El-Fayum region; about 80 km south west of Cairo. The stems of all gametophores of this sample arose from orange-brown swollen corm-like bases measuring about 1 mm in length and 0.6 mm in width (Fig. 1 A). "Corms" of fruiting individuals were slightly smaller in size (Fig. 1 B). This is a peculiarity that was not met with in other sites. Thus the bases of the stems of the gametophores of M. niloticum, and indeed of any other moss species, collected from all other sites in Egypt are only slightly thicker than the aerial stems; being about 0.1 - 0.2 mm thick. As far as we are aware there is no record in the literature of such structures. It is worth mentioning that this is the only sample of M. niloticum that grew on a calcareous substratum. And the following 19 algal taxa were met with under the moss plants in this sample.

Bacillariophycophyta

Amphora coffaeiformis Ag. borealis (Kz.) Cl.

Cocconeis placentula E. euglypta (E.) Grun.

Cyclotella meueghiniana rectangulata Grun.

Denticula tenuis Kz. genuina Grun.

Diploneis oblongella (Naeg.) A. Cl. v. lapponica.

Fragilaria bidens Heib.

F. pinnata E. genuina (Grun.) May. v. subrotunda

Gomphonema olivaceum Kz. tenellum (Kz.) Cl.

Nitzschia fasciculata Grun.

N. palea v. fonticola (Grun.) V.H.

N. vitrea Norman genuina Grun.

Rhopalodia gibba (E.) O. M.

R. gibberula (E.) O. M. musculus (Kz.) A. Cl.

R. gibberula (E.) O. M. producta (Grun.) A. Cl.

Chlorophycophyta

Chlamydomonas steinii Gorosch.

Chlorococcum sp.

Coelastrum naegeli proboscideum Bohlin.

Cyanophycophyta

Chroococcus turgidus (Kütz.) Näg.

Oscillatoria irrigua Kütz.

Whether the formation of the swollen stem bases of Micropoma gametophores is promoted by the calcareous substratum or by any of the co-existing algal taxa or by both is not known. Moss samples are deposited in CAIA.

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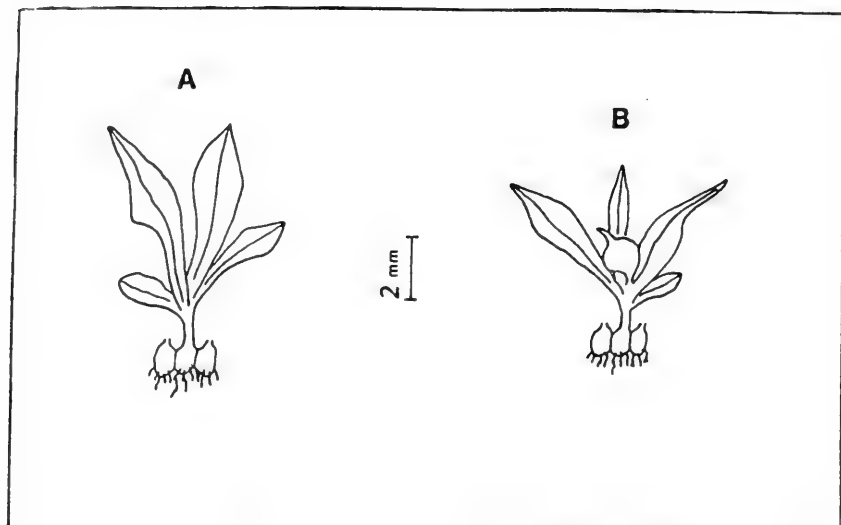


Fig. 1. Micropoma niloticum with corm-like stem bases.

A. Gametophyte. B. Gametophyte bearing sporophyte.

**EUCROSIA STRICKLANDII VAR. MONTANA AND THE IDENTITY OF PHAEDRANASSA
LOXANA (AMARYLLIDACEAE)**

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Recent examination of four specimens received on loan for the Flora of Ecuador project appear to represent a new variety of E. stricklandii (Baker) Meerow. Far more importantly, the discovery of this variety may resolve a vexing taxonomic problem in Phaedranassa.

Eucrosia stricklandii (Baker) Meerow var. **montana** Meerow, var. nov.

Varietas nova a varietas typica perianthio roseo et habitate *montana* differt. TYPE: Ecuador, Loja, below Cangonamã towards Panamerican Hwy w of Catacocha, on dry roadbank, 1800-2000 m, 1 Jan 1981, Balslev 1337 (holotype: NY!).

?Phaedranassa loxana Ravenna. Pl. Life 25: 57. 1969. (This binomial was presented as a new name for P. chloracra sensu Lindley without citation of any specimens).

Bulbous geophyte to 5-6 dm tall. Bulb ellipsoid, 3 X 4-4.5 cm; neck short, 1-3 cm long, ca 7 mm wide; tunics brown. Leaves hysteranthous, or occasionally emerging with the scape, imperfectly known, petiolate, the lamina elliptic. Inflorescence umbellate; scape slender, 3-6 dm tall, 4-5 mm diam proximally, 2-3 mm diam distally, terminated by two marcescent bracts that enclose the flowers before anthesis; bracts ca 21 mm long, ca 7 mm wide, lanceolate; inner bracteoles 10-13 mm long, ca 1-2 mm wide, linear. Flowers 5-7(-10), ca 3 cm long, pedicellate, funnelform-tubular, weakly zygomorphic; perianth tube subcylindrical, 9-10 mm long, ca 3 mm wide at the throat, constricted proximally, green for most of its length, distally concolorous with the tepals; tepals 6 in 2 series spreading slightly at the apices to ca 7 mm wide, lanceolate-spatulate, subequal, pink; outer tepals 18-19 mm long, minutely apiculate, inner tepals 16-17 mm long, obtuse; all ca 3 mm wide. Stamens 6, connate proximally into a conspicuous staminal cup; cup ca 1 cm long, with a deep oblong sinus on the dorsal side, irregularly cleft between the free portions of the filaments, edentate, slightly declinate, with a ridge of 6 globose nectar glands at the base, glands 1 mm diam; filaments narrowly subulate, 6-8 mm long, 2 exserted < 2 mm from the limb, the remaining four included; anthers ca 2 mm long, oblong. Style ca 35 mm long, filiform, exserted ca 5 mm from the limb; stigma capitate, minute, ca

0.5 mm wide. Ovary globose-ellipsoid, 3-4 mm diam; ovules axile, biseriate, numerous in each locule, flattened. Fruit and seed unknown.

ADDITIONAL MATERIAL EXAMINED: ECUADOR. Loja: Catamayo, 2800 m, 1876, Andre 4534 (K); no locality, 2000-2400 m, Oct-Nov 1888, Lehmann 4851 (K); Catamayo, 1400-1600 m, Nov 1888, Lehmann 4852 (K).

Eucrosia stricklandii var. montana differs from var. stricklandii by its pink perianth, flowering season, and, more significantly, by its altitudinal range of 1600-2800 m. It occurs in quebradas and along roadsides in the dry, grassy, scrub vegetation of Loja province (Fig. 1). It flowers from October-January. Variety stricklandii has red flowers, and inhabits the seasonally dry, Ceiba forests of El Oro, Guayas, and Manabi provinces in Ecuador (Fig. 1), always below 1000 m elevation. Its flowering season is August-October. In other respects, the two varieties are very much alike. Clearly, var. montana represents a geographic and ecological segregate of the species. An illustration of the species (var. stricklandii) may be found in Meerow and Dehgan (1985) as E. brachyandra Meerow & Dehgan.

Like so many species of Amaryllidaceae described in the 19th century, the plant originally described as Phaedranassa chloracra (Herbert) Herbert has a confusing taxonomic history. Ravenna (1969), in a synopsis of Phaedranassa Herbert, placed P. chloracra (Herbert) Herbert into synonymy with P. dubia (H.B.K.) Macbr. Herbert (1837) applied the basionym Phycella chloracra Herbert to the plant originally described as Haemanthus dubius H.B.K., from the Rio Guallabamba valley north of Quito. Herbert listed the latter under synonymy with Phycella chloracra, but ignored the priority of the epithet dubius.

In the same volume of Edwards' Botanical Register in which Herbert (1845) transferred Phycella chloracra into Phaedranassa, Lindley (1845) presented an illustration of a plant as Phaedranassa chloracra, citing an unnumbered Hartweg collection from Saraguro in Loja Province of Ecuador. Though he appears to have applied the name to a plant different than Herbert's, Lindley merely repeated Herbert's description! It is unclear whether Lindley actually saw material of the Hartweg collections to which he referred. The accompanying figure of the plant could as well represent several different species of Phaedranassa, a number of which differ only cryptically from each other.

Ravenna (1969) recognized P. chloracra sensu Lindley as a valid binomial (i.e. as P. chloracra Lindl.). He further chose to assign it a new name, P. loxana Ravenna. A detailed description accompanies the nomenclatural change. Though precise measurements of various vegetative and floral parts are provided in the description, no specimens are cited, and the distribution information is vague: "Ecuador, region of Loja" (Ravenna, 1969, p. 57).

There appears to be no specimen for P. chloracra from Loja province among the Hartweg collections I have received on loan from Kew.

In fact, I have not found any collections of Phaedranassa from Loja province among loans from numerous herbaria. In my own field studies, I have observed that Phaedranassa becomes increasingly rare as one travels south in Ecuador, and I have not encountered any populations in Loja.

Eucrosia stricklandii var. montana, however, occurs in the same vicinity that Hartweg supposedly collected in Loja province (Fig. 1). The variety also inhabits elevations more characteristic of Phaedranassa species than of most Eucrosia (Meerow, 1985). Moreover, the species has historically been treated incorrectly as a species of Phaedranassa (Bentham and Hooker, 1883; Ravenna, 1969). The pink coloration of the perianth of var. montana would add to the confusion; most Phaedranassa are pink-flowered. Thus there appears to be a strong likelihood that the Hartweg collection to which Lindley (1845) referred actually represented E. stricklandii var. montana. Unfortunately, specimens of this Hartweg collection have not been found.

Acknowledgments

I thank the curators of K, and NY for the loan of herbarium material cited in this paper, and Walter Judd and Dennis B. McConnell for their editorial suggestions. Florida Agricultural Experiment Station Journal Series No. 7235.

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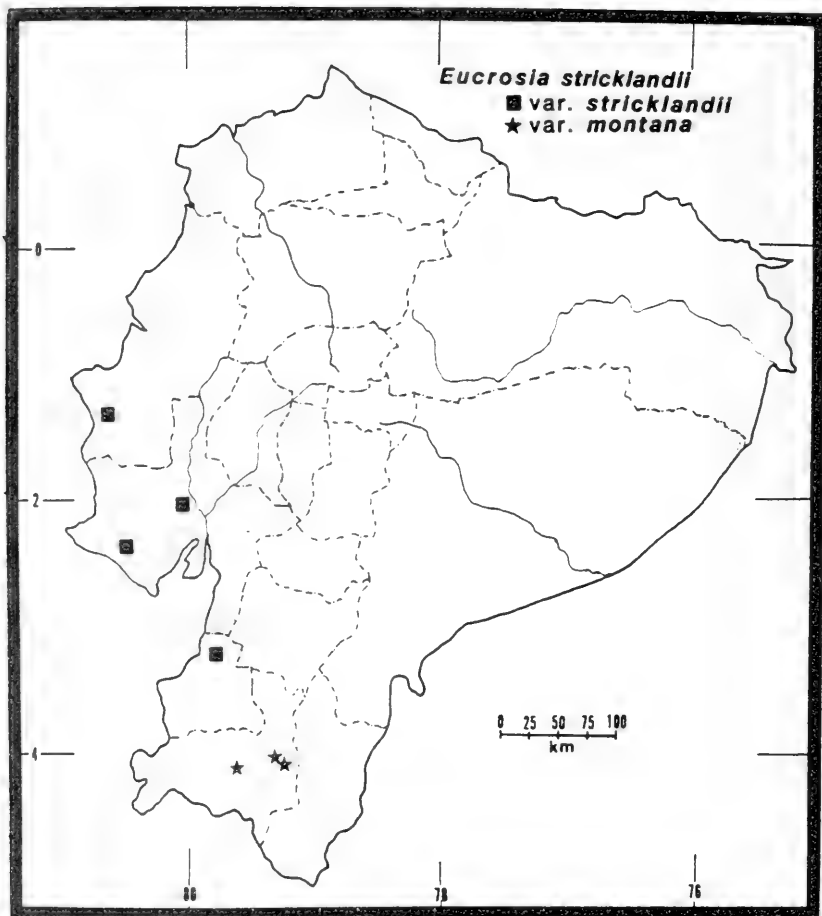


Figure 1. Distributions of *Eucrosia stricklandii* var. *stricklandii* and *E. s. var. montana* in Ecuador.

A NEW COMBINATION IN *PENSTEMON* (SCROPHULARIACEAE)

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Studies of the genus *Penstemon* in the Great Plains (Freeman, 1981) indicate the necessity of a nomenclatural change. This change is made in advance of my treatment of the genus in the forthcoming Flora of the Great Plains.

Penstemon glaber Pursh var. *brandegei* (Porter) C. C. Freeman, comb. nov.

Penstemon cyananthus Hook. var. *brandegei* Porter in Porter & Coulter, Syn. Fl. Colo. 91. 1874. *Penstemon brandegei* (Porter) Rydb., Mem. New York Bot. Gard. 1: 343. 1900.

Penstemon alpinus Torr. subsp. *brandegei* (Porter) C. W. T. Penland in Harrington, Man. Pl. Colo. 496, 641. 1954.

Type: UNITED STATES. Colorado. Fremont Co. (fide Pennell, 1920): "Sierra Mojado", T. S. Brandegee 930 (MO).

Penstemon glaber exhibits considerable morphological variation throughout its range, but has three reasonably distinct varieties. Typical var. *glaber* occurs primarily on sandy or gravelly soil on the unglaciated high plains and in the foothills of the Rocky Mountains from southwestern North Dakota and north-central South Dakota, west to northwestern Wyoming, and south to the panhandle of Nebraska.

Variety *alpinus* (Torr.) A. Gray occurs largely on the eastern slope of the Rocky Mountains up to 3300 m (11,000 ft) elevation. The variety is distributed from southeastern Wyoming south to south-central Colorado. In the northern part of its range, var. *alpinus* may be found on the high plains where it passes into var. *glaber*.

In central and south-central Colorado, var. *alpinus* is observed to intergrade with the more southern var. *brandegei*. The latter is found on the eastern slope of the southern Rocky Mountains at elevations to 1700 m (5500 ft), and is encountered sporadically in the foothills and on the high plains. Variety *brandegei* is distributed from south-central Colorado, south to northeastern New Mexico, and in parts of Colfax and Union Cos., New Mexico, it is locally common.

The three varieties of *Penstemon glaber* can be distinguished

by the following characters.

1. Sepals 2-4 mm long, lance-ovate to orbiculate and broadly rounded or with an abruptly short-acuminate tip; corolla glabrous or pubescent internally on the anterior surface; staminode rounded at the tip. var. *glaber*
1. Sepals 4-7 (10) mm long, ovate and usually with a long-acuminate tip; corolla glabrous to pubescent or villose internally on the anterior surface; staminode rounded to distinctly bifurcate at the tip.
 2. Staminode rounded or obscurely bifurcate at the tip; corolla 24-35 mm long; stems glabrous to pubescent. var. *alpinus*
 2. Staminode usually distinctly bifurcate at the tip; corolla 30-40 mm long; stems puberulent to pubescent. var. *brandegei*

LITERATURE CITED

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A NEW SPECIES OF ACHYROCLINE (INULEAE-ASTERACEAE) FROM PERU

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ABSTRACT - A new species of Achyrocline (Inuleae-Asteraceae) is described for northern Peru: Achyrocline peruviana Dillon & Sagást.; and an illustration and a key to the Peruvian species are provided.

Achyrocline is a genus of 15-20 species distributed primarily in tropical and subtropical South America, with a few in tropical Africa, Madagascar, and Comores, and one represented in Central America. This genus most closely resembles Gnaphalium in habit and floral structure; however, Achyrocline is readily distinguished by its cylindrical to narrowly campanulate involucre and few number of total florets (< 25). In Peru, some four species occur in a wide variety of habitats and elevations throughout the Andean Cordillera.

In preparation for an upcoming treatment of the Inuleae (Asteraceae) for the Flora of Peru the following species description is made.

Achyrocline peruviana Dillon & Sagást., sp. nov. Fig. 1.

Foliis angusto lanceolatis vel ellipticis, plerumque 4-5 cm longis, 2-8 mm latis, apice acutis, mucronatis a simili Achyrocline celosioides (Kunth in H.B.K.) DC. differt. Habitat in vallibus occidentalibus andinis siccis.

TYPUS: Peru, Cajamarca, Contumazá, El Granero, ladera abierta, 14 Jun 1983, 2800 m, A. Sagástegui A. & S. López M. 10661 (HUT, holotypus; F, MO, isotypí).

Suffrutescent perennials to 0.75 m tall, much-branched basally; stems arachnoid-tomentose. Leaves alternate, sessile, the blades narrowly lanceolate to elliptic, (1.5-) 4-5 cm long, 2-

8 mm wide, discolorous, basally attenuate, apically acute, mucronate, lower surface densely arachnoid-tomentose, upper surface sparsely arachnoid-tomentose, glabrescent, obscurely trinervate, the margins entire. Capitulescences glomerulate, cymose-paniculate, open, terminal and axillary. Capitula disciform, ca. 4 mm high, ca. 1.2 mm wide, sessile; involucre narrowly campanulate, stramineous; phyllaries 9-10, 2-3-seriate, subequal, glabrous, the outer phyllaries lanceolate, 2-3 mm long, ca. 1 mm wide, apically acute, the inner phyllaries lanceolate, 3-4 mm long, ca. 1.2 mm wide, apically acute; pistillate florets 1-2, the corollas filiform, ca. 2 mm long, apically ca. 4-cleft, the lobes densely glandular with multicellular trichomes, the style branches slender, apically truncate, penicillate; hermaphroditic florets 2-3, fertile, the corollas tubular, ca. 2.5 mm long, apically 5-lobed, the lobes densely glandular with multicellular trichomes, the style branches oblong, apically truncate, penicillate. Achenes ovoid, ca. 1 mm long, glabrous, brown; pappus bristles ca. 2.5 mm long, uniseriate, strigulose, free and falling separately.

DISTRIBUTION: Achyrocline peruviana is apparently a narrow endemic presently known only from dry intermontane localities in the Departments of Cajamarca and La Libertad (2600-3100 m.). Its distribution is primarily restricted to river valley systems with Pacific drainage.

Achyrocline peruviana is most closely related to A. celosioides, but differs from that species by possessing more narrowly elliptic or lanceolate leaves usually at least 4 cm long with acute, mucronate apices. The distribution of A. celosioides is primarily restricted to moist sites in river valleys with eastern (Atlantic) drainage from southern Ecuador to central Peru.

Some individuals of A. satureioides approach A. peruviana in general appearance, but the former species has narrowly cylindrical capitula and a distribution at lower elevations (below 1500 m) on the eastern escarpment of the Andean Cordillera.

Additional material examined: PERU. Dept. Cajamarca. Prov. Contumazá: 1-2 km S of Contumazá, 2620 m, Dillon, Sagástegui, & Dillon 4455 (F, HUT, MO, TEX, US, USM); Contumazá, 2600 m, Sagástegui et al. 10685 (F, HUT, MO). Dept. La Libertad. Prov. Huamachuco: Hda. Cochabamba, 2750 m, López & Sagástegui 2781 (HUT); Prov. Otuzco: Agallpampa, 3100 m, López 1867 (F, HUT), 895 (US).

Key to Peruvian Species of Achyrocline

1. Leaves decurrent; stems winged..... A. alata
1. Leaves not decurrent; stems unwinged.....2
 2. Leaves linear to linear-lanceolate; capitula tightly cylindrical, outer phyllaries ovate, apically obtuse or rounded3
 3. Plants with reduced habits, usually < 50 cm tall; leaves 2-3(-5) cm long, 1-3 mm wide..... A. ramosissima
 3. Plants not reduced in habit, usually > 1 m tall; leaves 4-10 cm long, 2-9 mm wide..... A. satereioides
2. Leaves lanceolate to elliptic or obovate; capitula narrowly campanulate, spreading; outer phyllaries lanceolate, apically acute.....4
 4. Leaves elliptic to obovate, (0.5-) 1.3-3.5 cm long, 5-16 mm wide..... A. celosioides
 4. Leaves lanceolate to elliptic, 1.5-5 cm long, 2-8 mm wide..... A. peruviana

ACKNOWLEDGMENTS

We thank Dr. Rolf Singer (F) for preparing the Latin diagnosis. The illustration was prepared by Segundo Leiva González, Universidad Nacional de Trujillo (HUT). This study was made possible by a grant from the NSF-Science In Developing Countries Program (INT-8512104). Field work by the junior author was supported, in part, by the Missouri Botanical Garden.

EXPLANATION OF FIGURE

Fig. 1. Achyrocline peruviana. A, habit; B, capitulum; C, outer phyllary; D, inner phyllary; E, hermaphroditic floret; F, pistillate floret; G, stamen; H, style branches of hermaphroditic floret. (Drawn from Sagástegui & López 10661, HUT).

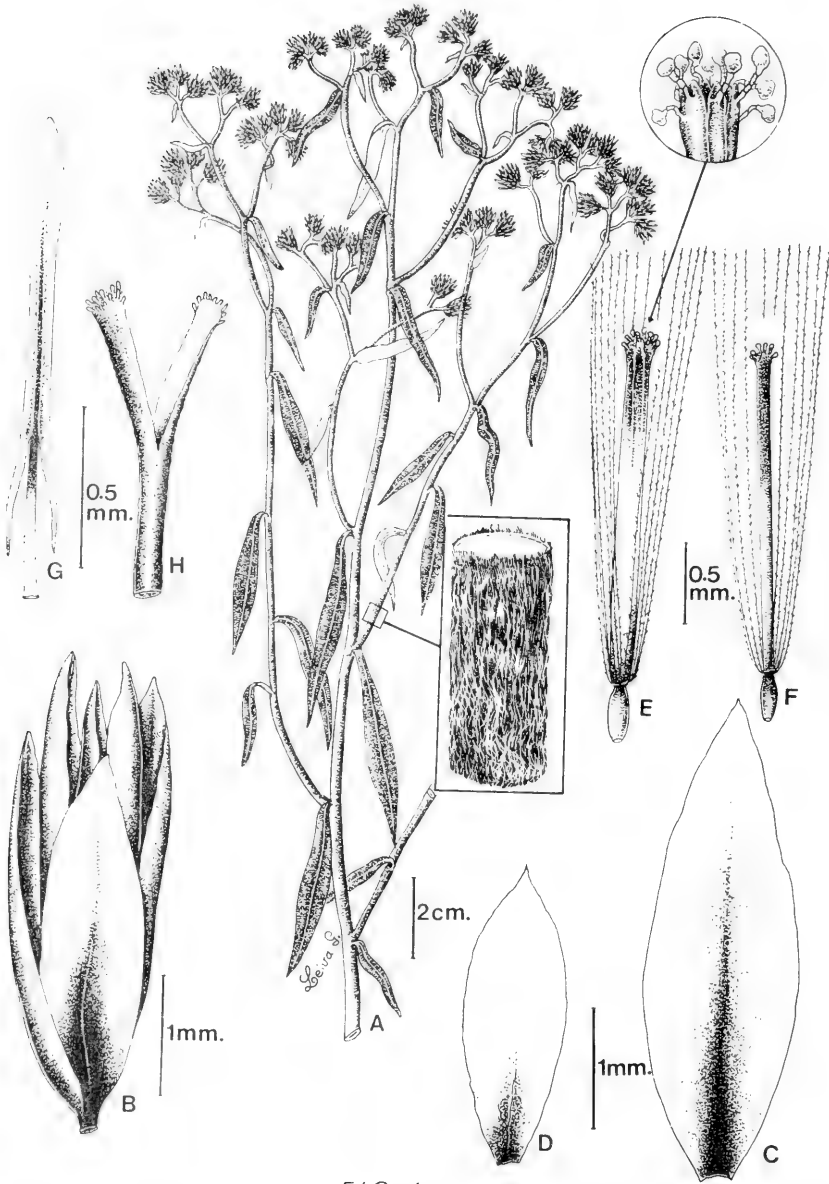


FIG. 1.

THE ALGAE OF NEW JERSEY (U.S.A.) IX. CHLOROPHYTA (GREEN ALGAE). C. CHLOROCOCCALES AND SIPHONALES

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This is the ninth paper in the series examining the distribution of algae in the state of New Jersey. The genera are listed alphabetically and the collection dates chronologically within them. Further ecological data may be obtained from the original sources.

DIVISION CHLOROPHYTA

GREEN ALGAE

Chlorococcales

Actinastrum gracilimum G.M. Smith
Delaware/Raritan Canal (D/R Canal) (6); Johnson Park, New Brunswick (7); Millstone River (11)

Actinastrum hantzschii Lagerheim
D/R Canal (6); Raritan River and Johnson Park (7)

Ankistrodesmus convolutus Corda
northern shore (16); Oradell Reservoir (17)

Ankistrodesmus falcatus (Corda) Ralfs
North Branch of Raritan River (11); northern shore (16); Oradell Reservoir (17)

Botryococcus braunii Kutz
ponds (3); state (4); D/R Canal (6); Pine Barrens (15)

Characium acuminatum A. Braun
South Branch of Raritan River (11)

Characium angustatum A. Braun
Johnson Park (7); Oradell Reservoir (17)

Characium gracillipes Lambert
Johnson Park (7)

Characium pringsheimii A. Braun
golf course ditch and Johnson Park (7)

Characium sessile Herm
Cranberry Pond, Sussex Co (3); state (4)

Characium stipitatum (Bachmann) Wille
D/R Canal (6)

Chlorella marina Butcher
northern shore (16)

Chlorella ovalis Butcher
northern shore (16)

Chlorella salina Kufferoth
northern shore (16)

Chlorella vulgaris Beyer
Oradell Reservoir (17)

Chlorococcum humicola (Naegli) Rabenhorst
northern shore (16); Oradell Reservoir (17)

Chodatella chodati (Bernard) Ley
D/R Canal (6)

Closteriopsis longissima Lemm.
D/R Canal (6)

Codiolum gregarium
Barnegat Bay (13)

Coelastrum cambricum Archer
ponds (3); South Branch of Raritan River (11)

Coelastrum microporum Nag
ponds (3); D/R Canal (6); Johnson Park (7)

Coelastrum proboscideum Bohlin
state (4)

Coelastrum sphaericum Nag
Oradell Reservoir (17)

Crucigenia apiculata (Lemm) Schmidle
Johnson Park (7)

Crucigenia fenestrata Schmidle
Johnson Park (7)

Crucigenia quadrata Morren
Johnson Park (7)

Crucigenia rectangularis (Nag) Gray
D/R Canal (6)

Dictyosphaerium ehrenbergianum Naeg
frequent in ponds (3); state (4)

Dictyosphaerium pulchellum Wood
D/R Canal (6); Johnson Park (7)

Dictyosphaerium reniforme Bulnh
occasional in ponds (3); state (4)

Dimorphococcus cordatus Wolle
ponds (2)

Eremosphaera viridis De By
frequent in small pools (3)

Errerella bornhemiensis Conrad
D/R Canal (6)

Golenkinia paucispina W & GS West
D/R Canal (6)

Hydrodictyon reticulatum (L) Lagerheim
Johnson Park (7); North and South Branches of Raritan,
Millstone River and Raritan River (11)

Hydrodictyon utriculatum Roth
frequent in sluggish waters (3)

Kirchneriella obesa (Kirchner) Moebeus
D/R Canal (6)

Pediastrum angulosum (Ehrb) Menegh
frequent in ponds (3); state (4)

Pediastrum asperum
Hackensack River (18)

Pediastrum biradiatum Meyen
D/R Canal (6); South Branch of Raritan River (11)

Pediastrum boryanum (Turp) Meneghini
ponds (3); state (4); D/R Canal (6); Raritan Estuary (9);
North and South Branch of Raritan River, Millstone River
(11); Hackensack River (14, 18)

Pediastrum boryanum var. longicorne Raciborski
North and South Branch of Raritan River (11)

Pediastrum clathratum (Schroeter) Lemm
Hackensack River (18)

Pediastrum duplex Meyen
state (4); D/R Canal (6); Johnson Park (7); Raritan Estuary
(9); North and South Branches of Raritan River (11)

Pediastrum duplex var. clathratum (A. Braun) Lag
D/R Canal (5); North and South Branches of Raritan River and
Millstone River (11); Hackensack River (14); Oradell
Reservoir (17)

Pediastrum duplex var. cohaerens Bohlin
Millstone and Raritan Rivers (11)

Pediastrum duplex var. gracillimum West & West
D/R Canal (6); North and South Branches of Raritan River and
Millstone River (11); Hackensack River (14); Oradell
Reservoir (17)

Pediastrum duplex var. reticulatum Lag
D/R Canal (6)

Pediastrum ehrenbergii (Corda) A. Braun
frequent in pools (3)

Pediastrum forcipatum (Corda) A. Braun
frequent in ponds (3); state (4)

Pediastrum gracillimum W & G.S. West
D/R Canal (6)

Pediastrum integrum Nag
Hackensack River (18)

Pediastrum muticum Kutz
ponds, occasional (3)

Pediastrum obtusum Luchs
North and South Branches of Raritan River (11)

Pediastrum pertusum Kutz
everywhere in pools (3)

Pediastrum salenaea Kutz
South Branch of Raritan (11)

Pediastrum simplex Meyen
South Branch of Raritan River (11); Hackensack River (18)

Pediastrum simplex var. duodenarium (Bail) Raben
D/R Canal (6); South Branch of Raritan River (11); Oradell
Reservoir (17); Hackensack River (18)

Pediastrum tetras (Ehr) Ralfs
frequent in pools (3); state (4); D/R Canal (6); North and
South Branches of Raritan River and Millstone River (11);
Hackensack River (18)

Pediastrum tetras var. tetraodon (Corda) Hansg
Hackensack River (18)

Pediastrum tricornutum Borge
Hackensack River (18)

Scenedesmus abundans (Kirch) Chodat
South Branch of Raritan River (11)

Scenedesmus abundans var. assymetrica (Schroed) G.M. Smith
South Branch of Raritan River (11)

Scenedesmus acuminatus (Lag) Chodat
Johnson Park (7); North and South Branches of Raritan River
(11)

Scenedesmus acutiformis Schr
North Branch of Raritan River and Millstone River (11)

Scenedesmus acutus Meyen
shallow, stagnant water (3); North and South Branches of
Raritan River (11)

Scenedesmus arcuatus Lem
D/R Canal (5); Raritan River (7)

Scenedesmus armatus (Chod) G. M. Smith
Johnson Park (7); Oradell Reservoir (17)

Scenedesmus attenatus Breb
South Branch of Raritan (11)

Scenedesmus bijuga (Turp) Lager
D/R Canal (6); North and South Branches of Raritan River and
Millstone River (11); Oradell Reservoir (17)

Scenedesmus bijuga var. alternans (Reinsch) Bory
North Branch of Raritan River (11)

Scenedesmus caudatus Corda
shallow, stagnant water (3)

Scenedesmus denticulatus Lag
North Branch of Raritan River (11)

Scenedesmus dimorphus (Turp) Kutz
shallow, stagnant water (3); D/R Canal (5); Johnson Park
(7); Raritan Estuary (9); South Branch of Raritan River
(11); Oradell Reservoir (17)

Scenedesmus incrassatulus Bohlin
North and South Branches of Raritan River and Millstone

River (11)

Scenedesmus longus Meyen
Johnson Park (7)

Scenedesmus longus var. naegeli (Breb) G.M. Smith
North Branch of Raritan River (11)

Scenedesmus obliquus (Turp) Kutz
D/R Canal (5); North and South Branches of Raritan River
(11)

Scenedesmus obtusus Meyen
shallow, stagnant freshwater (3)

Scenedesmus opoliensis P. Richter
Johnson Park (7); Raritan Estuary (9); North Branch of
Raritan River (11)

Scenedesmus perforatus Lemm
Millstone River (11)

Scenedesmus protuberans Fritsch & Rich
Johnson Park (7)

Scenedesmus quadricauda (Turp) Breb
D/R Canal (5); Johnson Park and Raritan River (7); Raritan
Estuary (9); North and South Branches of Raritan River and
Millstone River (11); Barnegat Bay (12); northern shore
(16); Oradell Reservoir (17)

Scenedesmus quadricauda var. longispina (Chodat) G.M. Smith
North and South Branches of Raritan River and Millstone River
(11)

Scenedesmus quadricauda var. maximum West & West
South Branch of Raritan River (11)

Scenedesmus quadricauda var. parvus G.M. Smith
South Branch of Raritan River (11)

Scenedesmus quadricauda var. quadrispina (Chodat) G.M. Smith
Raritan River (11)

Scenedesmus quadricauda var. westii G.M. Smith
North Branch of Raritan River (11)

Schroederia setigera (Schroeder) Lemm
D/R Canal (6)

Selenastrum bibraium Reinsch
D/R Canal (6)

Sorastrum spinulosum Nag
frequent in ponds (3)

Tetraedron gracile (Reinsch) Hansg
D/R Canal (6)

Tetraedron lobulatum (Nag) Hansg
D/R Canal (6)

Tetraedron minimum (A Braun) Hansg
northern shore (16)

Tetraedron trigonium var. gracile (Reinsch) De Toni
D/R Canal (6)

Tetraedron trigonium var. punctatum (Kirchner) Hansg
state (4)

Treubaria triapendiculata Bernard
D/R Canal (6)

Siphonales

Bryopsis hypnoides Lamour
Jersey City on ferry bridge (3); Barnegat Bay (13)

Bryopsis plumosa (Huds) C. Ag
Atlantic City (1); Great Egg Harbor (3); Cape May (5);
Raritan Bay (8); Great Bay and Mullica River (10); Barnegat
Bay (13)

Codium fragile ssp tomentosoides
Barnegat Bay (13)

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PASSIFLORA TRYPHOSTEMMATOIDES AND ITS ALLIES

by

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ABSTRACT

The status of *Passiflora* subgenus *Tryphostemmatoides* (Harms) Killip is discussed and a key to the species of this group is provided.

INTRODUCTION

Killip (1938) separated the Subgenus Tryphostemmatoides (Harms) Killip from the closely related Subgenera Deidamioides (Harms) Killip and Plectostemma Mast. by a combination of tendril bearing inflorescences, non plicate operculum, and bracts crowded at base of the pedicel (for terminology see Killip 1938 and Jørgensen et al. 1984). In our opinion all species of Subg. Tryphostemmatoides have at apex a slightly plicate or at the least rough operculum, just as seen in *Passiflora filipes* or *P. tenella*, both recognized members of Subg. Plectostemma. The floral morphology of Subg. Tryphostemmatoides does not deviate from the general arrangement in Plectostemma. Tryphostemmatoides is accordingly reduced to a Section of Subg. Plectostemma.

Subg. Deidamioides and Apodogyne Killip are in our opinion very likely to be included in Plectostemma as well, but no material has been studied and no decision is made.

The species P. gracillima and P. tryphostemmatoides were, as indicated by Knapp & Mallet (1984), wrongly equated in Woodson & Schery (1958). On the basis of this and the insufficient key characters in Killip's monograph (1938), plus the description of P. arbelaezii L.Uribe, we have felt that a key, short description and a distribution map for the Section were needed.

Passiflora Subg. Plectostemma Mast. emend P.M. Jørgensen & Holm-Nielsen Sect. Tryphostemmatoides Harms.

Passiflora Sect. Tryphostemmatoides Harms, in Engl. & Prantl, Nat. Pflanzenfam., ed. 2. 21: 500. (1925).

Passiflora Subg. Tryphostemmatoides (Harms) Killip, P. Field. Mus. Nat. Hist., Bot. Ser. 19(1):24-25. (1938).

Type species: Passiflora tryphostemmatoides Harms.

Delicate lianas, glabrous throughout. Stem terete or angular, striate. Stipules 1 mm, setaceous, often deciduous. Petioles with 2-4 sessile or stipitate glands borne at the junction to blade. Inflorescences axillary, with 2 pedicellate flowers, terminating in an often deciduous, minute tendril. Bracteoles setaceous, often deciduous. Calyx patelliform. Corona 1- to 3-seriate. Operculum plicate to slightly plicate, or rough. Nectar ring annular. Limen cupuliform. Ovary glabrous. Seeds reticulate.

Key to Passiflora Subg. Plectostemma Sect. Tryphostemmatoides

- 1a. Limen less than 1.5 mm high. Corona uniseriate. Flower less than 1.7 cm wide. Fruit subglobose 1.8-2.7 x 1.5-2.5 cm. Fig. 1.1. P. tryphostemmatoides
- 1b. Limen more than 1.5 mm high. Corona 1- to triseriate. Flowers more than 1.7 cm wide. Fruit ovoid or fusiform 2.5-6.4 x 1.5-2.4 cm.
- 2a. Limen closely appressed the androgynophore, margin entire. Corona 1- or biseriate. Peduncle less than 3.5 cm long. Fig. 1.....2. P. gracillima
- 2b. Limen free, margin denticulate. Corona 2- or triseriate. Peduncle longer than 3.5 cm1. P. arbelaezii

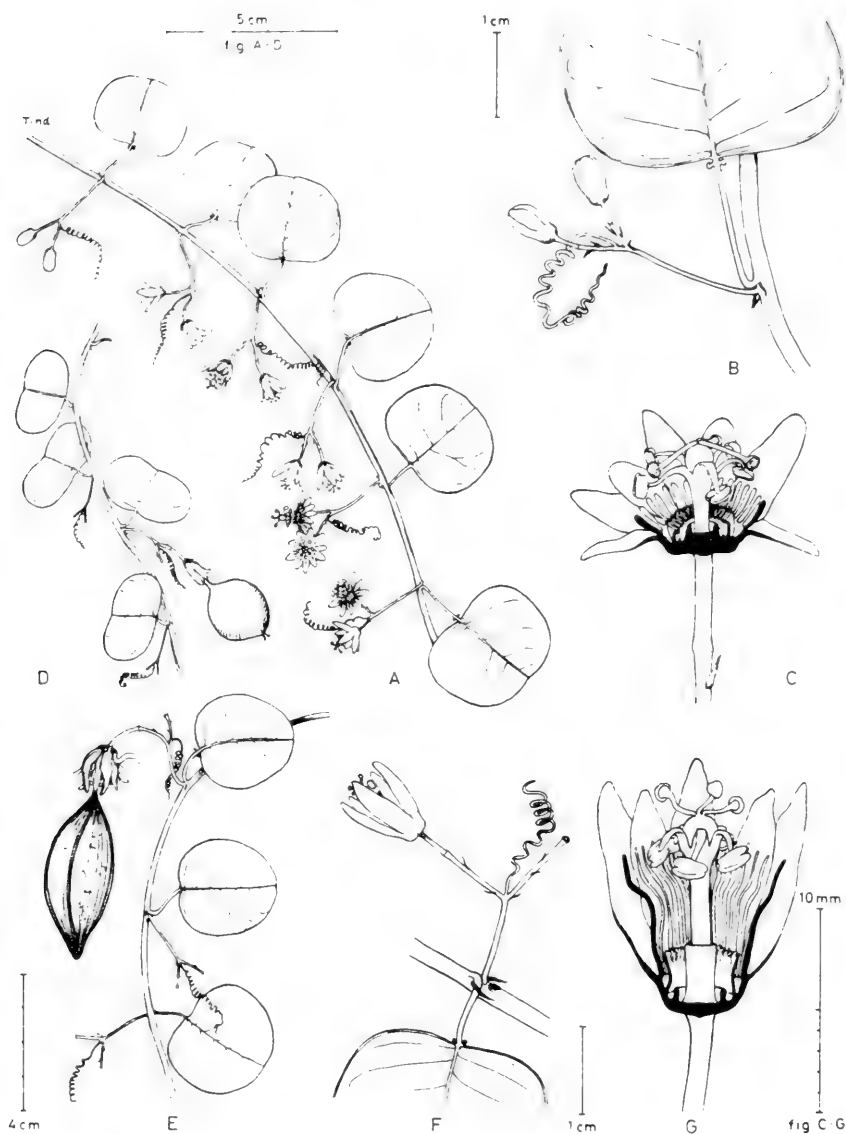


Fig. 1. *Passiflora tryphostemmatoides* A. fruit (Lehmann 5662), B. cross section of flower (Asplund 19605). *P. gracilima* (Rimbach 222) C. fruit, D. cross section of flower.

1. Passiflora tryphostemmatoides Harms, Bot. Jahrb. 18, Beibl. 46: 7 (1894). Fig 1. A, B and 2.

Petioles 0.4-2.0 cm. Blade 0.6-4.0 x 1.1-3.5 cm, broadly ovate to orbicular, or transversely ovate, obtuse, base truncate to cordate. Peduncle 0.5-1.7 cm. Pedicels 2-6 mm in flowers, to 9 mm in fruit. Flowers 1.0-1.6 cm wide. Corona uniseriate, 2-4 mm. Operculum 1-1.5 mm, plicate. Limen 1 mm, cupuliform. Fruit subglobose 2.7 x 1.5-2.5 cm.

Specimens examined: Colombia: Popayan, Central Andes, 1500-1800 m, Lehmann 5662 (K isotype). Valle, La Cumbre, 1800-2100 m, Killip 5561 (C,P) Pennel 5154 (G). Ecuador: Azuay, Highway Cuenca-Cola de San Pablo, Río Negro, 1540 m, Boeke & Loyola 1056 (AAU); Cruz Pamba, 2315-2500 m, Steyermark 52932 (F, US). Napo, Archidona, Jundache, 1100 m, Asplund 10314 (S); Slopes of Guagra Urco, above Río Borja, 2600 m, Holm-Nielsen et al. 27038 (AAU); Near Guagra Urco, Río Suno, 2900 m, Holm-Nielsen et al. 27557 (AAU). Pastaza, Mera, 1100 m, Asplund 19605 (G, NY, UPS, S).

2. Passiflora gracillima Killip, J. Wash. Acad. Sci. 14: 112. (1924). Fig 1. C, D and 2.

Petiole 1.1-2.7 cm. Blade 2.0-4.0 x 1.5-4.5 cm, ovate, obtuse to retuse, base slightly cordate. Peduncle 0.5-3.1 cm. Pedicel 0.8-1.2 cm. Flowers, 1.8-2.3 cm wide. Corona 1- or triseriate, outer filaments 7-11 mm (inner filaments not present in the examined material). Operculum 2-3 mm erect, slightly plicate. Fruit 5.0-6.4 x 1.8-2.4 cm, fusiform, 6 angled.

Specimens examined: Colombia: Narino, Between Meneses and Pasto, 2400 m, André 2882 (Photo in AAU). Ecuador: Bolivar-Chimborazo, W. Cordillera, Riobamba, 2600 m, Rimbach 222 (GH, F, NY, US). Napo, Between Baeza and Cuyuja, Asplund 9610 (S). Prov. unknown, Chagal, Lehmann s.n. (K).

3. Passiflora arbelaezii L. Uribe, Caldasia, 7(35): 335. (1957). Fig. 2.

Petiole 1.5-2.6 cm. Blade 2.2-3.5 x 2.3-3.5 cm, ovate, retuse to apiculate, base truncate to slightly cordate. Peduncle 4-4.7 cm. Pedicel 1.4-2.5 cm. Flowers 2.5 cm wide. Corona 2- to triseriate, outer filaments 12 mm, inner one or two series 2-3.5 mm. Operculum 2-3 mm erect, slightly plicate. Fruit 2.6 x 1.6-2 cm, ovoid.

Specimens examined: Colombia: Valle, Vertiente occidental, Río Sabaletas, Arbeleaz 10335 (COL holotype). Panama: Chiriqui, Hart 104 (K).

Passiflora tryphostemmatoides, P. arbelaezii and P. gracillima differ especially in the height, relative position and shape of the limen, but also in different fruit forms and the size of the flower and peduncles, however, the vegetative features of the species are very similar. The three species are therefore difficult to distinguish in sterile state, this plus a small amount of indeterminable sterile sheets from Ecuador, of very interesting and probably new species, makes us recommend that sterile material of Passiflora, unlike Knapp & Mallet (1984), is not collected (Jørgensen et al. 1984).

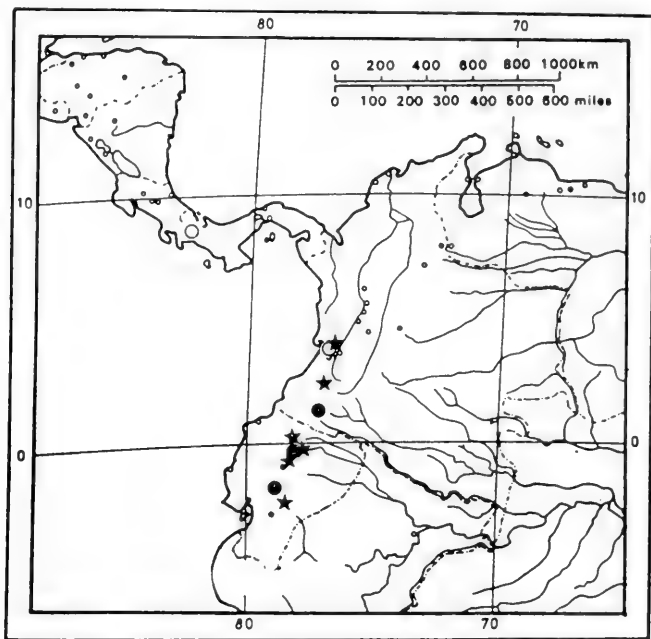


Fig. 2. Distribution map for Passiflora arbelaezii (O), P. gracillima (●) and P. tryphostemmatoides (★).

ACKNOWLEDGEMENTS

This is contribution No. 54 from the AAU-Ecuador Project. We wish to thank Kirsten Tind for her skillful drawings.

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A NEW SPECIES OF WEDELIA (ASTERACEAE-HELIANTHEAE)
FROM NUEVO LEON, MEXICO

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Recent collections among the precipitous upper limestone ridges of the east-facing Sierra Madre Orientale overlooking the city of Monterrey has revealed the following novelty. It is placed in the genus Wedelia with some hesitation since it might equally be placed in the genus Aspilia (sensu H. Robinson, 1984) because it has "a constricted apical crown bearing all the pappus elements, having little or no wing on the achene, and having sterile rays." Aspilia is supposedly distinguished from Wedelia by its pistillate but sterile ray florets and largely wingless achenes. The present species, while mostly bearing sterile ray florets, does produce the occasional ray achene which is seemingly fertile, being distinguished from those of the disc by being nearly glabrous.

McVaugh (1984) includes the Mexican species of Aspilia occurring in his Flora Novo-galiciana within Wedelia, commenting that "The distinction between Wedelia and the genus Aspilia Thors is not always a clear one." A comment that appears valid to me, in spite of Robinson's (1984) efforts to maintain both.

Wedelia ayerscottiana B. L. Turner, Fig. 1

Wedelia hispida accedens sed caulibus tenuibus simplicibus capitulis minoribus, pedunculis brevioribus, achaenis variegatis nonalatis, etc.

Perennial erect or weakly ascending herb to 1 m high. Stems terete, striate, mostly unbranched, stiffly hirsute with multicellular spreading trichomes, 1-2 mm long, these interspersed among a much shorter indument of scabrid, often glandular, hairs. Leaves opposite, 4-8 cm long, 2-3 cm wide; petioles 2-6 mm long, stiffly-hirsute; blades narrowly triangular, acutely tapering onto the petioles, 3-nerved from above the base, coarsely and evenly hispid on both surfaces, the margins minutely crenulate to irregularly and coarsely dentate, darkening upon drying, the upper surface more so. Heads 3-6 in terminal or axillary cymes, the peduncles 2.0-4.5 cm long. Involucres campanulate, 7-8 mm high, 5-12 mm wide; bracts about equal, in 3 series, the outer-most broadly ovate to obovate, leafy, 4-6(7) mm long, 3-4 mm wide coarsely hispid, the middle and inner-most broadly obovate, scarious and yellowish-erose above, puberulent to glabrous. Chaff somewhat shorter than the subtended florets, yellow above, purplish below, with a prominent purple mid-nerve and bright yellow appendages. Ray florets 8, pistillate, fertile or often not so; corollas yellow, the ligules 6-7 mm long, 3.0-3.5 mm wide. Disk florets 30-

50; corollas yellow, ca 5 mm long, glabrous, the tube ca 1.5 mm long, tapering into a narrowly funnelform throat, the lobes ca 0.8 mm long. Achenes essentially monomorphic, markedly mottled, obovate, the body ca 4 mm long, ca 1.8 mm wide, bearing at its apex a slender neck ca 0.6 mm long which is topped by a minute scaly crown ca 0.2 mm high.

TYPE: MEXICO. Nuevo Leon: Slopes above Chipinque Mesa and Motel, SW and overlooking Monterrey, ca 6000 ft elevation. Oak-pine forests; 12 Oct 1985; B. L. Turner, T. Ayers and R. Scott 15609 (holotype TEX; isotype MEXU).

When first encountered I thought the plants concerned belonged to the common Aldama dentata Llave. In living plants the habitual resemblance is remarkable. The heads are also remarkably similar, being about the same size with similar involucre bracts, including texture and dark striations which are so characteristic of A. dentata. The achenal characters, etc., are like those of Wedelia except that the achenes of both ray and disc florets are alike, both lacking any sign of wings and those of the ray not at all 3-angled. Except for its neck structure and basal elaisome, the body of the achene is surprisingly like that of Viguiera dentata.

Wedelia ayerscottiana was rare at the site concerned, only two plants having been observed, both growing in the leafy-litter of an oak-dominated low forest. It occurs with a bevy of yet other local composite endemics including Ageratina rollinsii Turner, A. viburnoides (DC.) K. & R., Flyriella leonensis (B. L. Rob.) K. & R., Vigethia mexicana Wats., etc.

The species is named for my two field companions, both in the terminal year of their doctoral and both in love with botany and each other. I have taken liberty to perpetuate these facts, at least in name, if not spirit.

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Fig 1 *WEDELIA AYERSCOTTIANA*, from holotype.

NOTES ON THE GENUS CLERODENDRUM (VERBENACEAE). XVIII

Harold N. Moldenke

CLERODENDRUM Burm.

Additional & emended bibliography: Chakravert, Curr. Sci. 20: 48--49. 1951; Navalkar, Journ. Bomb. Nat. Hist. Soc. 50: 157--160. 1951; Sheriar, Sci. Cult. 17: 218--219. 1951; Anon., Biol. Abstr. 26: 3472. 1952; Chakravert, Bio. Abstr. 26: 1750. 1952; Eyster, Biol. Abstr. 26: 3141. 1952; Mold., Biol. Abstr. 26: 185 & 1471. 1952; Patel, Biol. Abstr. 26: 2879. 1952; Pichi-Sermolli, Biol. Abstr. 26: 642. 1952; Quaintance, Biol. Abstr. 26: 1017. 1952; Sheriar, Biol. Abstr. 26: 3184. 1952; Willaman & Schubert, Agric. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 236 & 237. 1961; Stoddart & Fosb. in Stoddart, Biogeogr. Ecol. Seych. Isls. 232. 1984; Mold., Phytologia 60: 56--70. 1986.

Subramanian and his associates (1973) report the presence of the sterol, (24S)-ethylcholesta-5,22,25-triene-3 β -ol, in five *Clerodendrum* species (*C. indicum*, *C. inerme*, *C. infortunatum*, *C. phlomidis*, and *C. thomsonae*) and suggest that this sterol may be considered as a possible chemotaxonomic marker for the genus.

CLERODENDRUM GRANDIFLORUM (Hook.) Schau.

Additional bibliography: Mold., Suppl. List Inv. Names 3. 1941; Mold., Phytologia 60: 67--70. 1986.

Lemaire (1848) comments regarding this species: "Il est vraiment regrettable que tant de belles plantes, introduites directement en Belgique, sortent ensuite de ce pays pour aller orner les collections étrangères, soit sous des noms erronés et donnés à hâte, soit, mais plus rarement, exacts et dont les jardiniers estropient plus ou moins l'inscription des étiquettes. Dans le premier cas, les expéditeurs ne sont pas excusables: car la Belgique ne manque pas de botanistes distingués qui pourraient déterminer les plantes nouvelles; dans le second, le chef de l'établissement-expéditeur ne l'est pas davantage, car la suscription des étiquettes devrait exercer sa surveillance. Or, l'introduction directe et la détermination de plantes nouvelles est aussi une chose grande et glorieuse pour un pays! Pourquoi donc répudier cette gloire? Ajoutons à ces justes reproches, que le destinataire se plaint avec raison de ne recevoir souvent avec ses plantes aucun renseignement sur leur patrie, etc. Nous pourrions citer une foule de preuves à l'appui de ces observations; nous nous contenterons seulement de faire observer que, c'est surtout de l'autre côté du détroit, qu'en raison des faits que nous signalons, s'exerce souvent une critique assez acerbe contre l'horticulture belge, laquelle dans ces circonstances, cependant, ne fait que tirer les marrons du feu pour les laisser croquer aux autres. Sic vis non vobis....tulit alter honores. Nous espérons bien que ces réflexions, que nous inspirent l'honneur et l'intérêt de notre patrie adoptive, seront acceptées et jugées avec le même esprit qui

nous les a dictées. La plante qui fait le sujet de cet article, a été expédiée (nous dit M. Hooker) par un des établissements les plus distingués de la Belgique, à une maison anglaise sous le nom improprie de *Rondeletia* à fleurs jaunes, et sans autre renseignement. L'absence complète de stipules aurait du tout d'abord démontrer que cette belle plante ne pouvait être une Rubiacée."

Van Houtte (1848) says concerning its cultivation: "Cette espèce, en raison de la lignosité de ses rameaux, demandera des soins assidus en cas de bouturage. Il faudra surtout veiller à en éloigner toute humidité stagnante soit dans la cloche, soit autour des boutures. Comme elle donne facilement des graines, il sera plus commode et plus avantageux de la multiplier par ce moyen. Pour le reste, elle demande la même culture que celle qu'on applique aux autres arbrisseaux de serre chaude. On lui donnez une terre mélangée, mais par la raison que j'ai alléguées ci-dessus, on decra le ménager les arrosements, car la plante transpire peu."

The original description given by Turczaninow (1863) for his *Aegiphila aurea* is: "Ae. caule fruticoso tereti ad nodos tetragono-compresso glabro, tuberculis elevatis aspero; foliis obovato-oblongis, abrupte et breviter acuminatis integerrimis, utrinque glabris coriaceis; panícula terminali folia subaequante; calycis dentibus e basi subquadrata cuspidatis; corolla tenuiter puberula calyce 5-6-tuplo longiore." It is based on J. J. Linden 131 from the province of Havana, Cuba.

His original (1863) description of *Citharexylum longiflorum* is: "Caule tetragono tuberculato glabro aut apice tenuiter puberulo; foliis oppositis breviter petiolatis, per paria interdum approximatis lanceolatis, basi parum attenuatis, in acumen breve abrupte productis, margine revolutis integerrimis, supra glabris viridibus subtus pallidioribus ad nervationes leviter puberulis; panícula terminali folia subaequante; floribus in pedicellis infractis mutantibus; corolla tubo calycis 4-5-plo longiore. Calyx campanulatus, basi nigricans, brevissime 5-dentatus, hirtellus. Corolla tubuloso-infundibuliformis, extus puberula, intus glabra. Filamenta in parte inferiore tubi verticillatim affixa, basi dilatata, parum inaequalia, antheris duplo longiora. Antherae ellipticae, dorso interlocilos affixae, inclusae. Stylus longitudine staminum, filiformis, apice non incrassatus. Species longitudine florum et filamentorum ab omnibus mihi notis diversa." It is based on Sagra 50 from somewhere in Cuba, probably Havana.

Clerodendron sagraei was based by Schauer (1847) on Sagra 300, 591, and s.n. also from Havana, Cuba.

Collectors have encountered *C. grandiflorum* growing on hillsides and serpentine barrens, in wooded valleys and forests, on mountains and dry limestone hills, in thickets and oak woods, along streams, and on riverbanks, in flower from October to April and in August, and in fruit in August and from December to February. Alain (1974) asserts that it is endemic to Cuba and there occurs in woods in Havana and Pinar del Río provinces and on the Isle of Pines.

Schauer (1847, in keeping *C. grandiflorum* and *C. sagraei* apart as two separate species, comments about the former: "Videtur a *C. Sagraei* differre tantum foliis basi subcordatis, corollâ paululum majore,

et floribus erectis, si ex vivo ut ex sicco erecti in *C. Sagraei*.' Syngé (1956) says that it was introduced into cultivation in England in 1843 from the West Indies. Roig found it cultivated as an ornamental in Cuba. The corollas are described as having been "yellow" on *Alain & Killip 2008* and *Morton 4274* and by all authors who refer to the color and as "brilliant yellow" on *Ekman 12644*.

Gibbs (1974) reports negative results, with blue fluorescence, from the Juglone test of the leaves, stems, and roots of this plant. Common and vernacular names reported for it are "bois-de-cabri à grandes fleurs", "large yellow-flowered aegiphila", "oviedo", "oviedo amarillo", "oviedo blanco", "oviedo de flor blanca" and "ovieda flor blanca".

It may be noted here that *Alain 488* exhibits especially large leaves. A sheet of *Wright 3176* in the British Museum herbarium consists of a branch with holly-like leaves, re-annotated as probably bignoniaceous, which probably represents a species of *Pseudocarpidium*.

Alain (1974) distinguishes the Cuban species of *Clerodendrum* known to him as follows:

1. Spinose shrubs or vines; cymes axillary.....*C. aculeatum*.
- 1a. Unarmed shrubs or herbs; cymes axillary or terminal.
2. Large herbs, with broad membranous leaves.
3. Leaf-blades basally deeply cordate; corollas scarlet.....
C. speciosissimum.
- 3a. Leaf-blades basally only shallowly cordate; corollas white.
4. Leaf-blade margins mostly dentate, the teeth large and conspicuous, pilose on both surfaces; corollas doubled.....
C. philippinum f. *multplex*.
- 4a. Leaf-blades marginally mostly entire or minutely denticulate, glabrescent; corollas simple.....*C. lindleyi*.
- 2a. Shrubs; leaf-blades mostly narrow, coriaceous.
5. Leaf-blades mostly more than 5 cm. long, apically obtuse or rounded, basally subcordate, marginally entire or with a few irregular teeth.
6. Corollas yellow, pubescent, the limb small, not spreading; leaf-blades mostly obovate or oblanceolate.*C. grandiflorum*.
- 6a. Corollas white, glabrous or glabrescent, the limb spreading, narrow; leaf-blades obovate to elliptic or oblong-lanceolate.
7. Leaves subsessile or with a petiole to 1 cm. long, the blades mostly basally subcordate.
8. Leaf-blades obovate to oblanceolate, apically mostly obtuse to cuspidate.....*C. cubense*.
- 8a. Leaf-blades lanceolate to oblong-lanceolate, apically acute to rounded.....*C. nipense*.
- 7a. Leaves petiolate (the petioles sometimes very short), basally mostly rounded (subcordate in *C. calcicola* and in some forms of *C. lindenianum*).
9. Leaf-blades glabrous on both surfaces or puberulent on only the veins beneath.
10. Inflorescence mostly longer than the subtending

- leaves; peduncles puberulous; cyme-branches verruculose.....*C. lindenianum*.
 10a. Inflorescence shorter than the subtending leaves; peduncles glabrous; cyme-branches not verruculose....
C. anafense.

9a. Leaf-blades pubescent beneath.

11. Leaf-blades rounded at both ends....*C. tuberculatum*.

11a. Leaf-blades basally subcordate, apically acute or obtuse.....*C. calcicola*.

5a. Leaf-blades 2.3--5.5 cm. long, elliptic or obovate, basally acute, marginally regularly denticulate.....*C. denticulatum*.

A key for distinguishing *C. grandiflorum* from other taxa found in regular cultivation will be found under *C. bethunianum* Low in the present series of notes (58: 198).

The *C. grandiflorum* credited to Gürke by my wife and myself in our 1983 work on Sri Lankan plants, is the result of an unfortunate error in transcription for *C. grandifolium* Gürke, and the *C. grandiflorum* credited by us in the same work to Salisbury is a synonym of *C. serratum* (L.) Moon. The *Clerodendron grandiflorum* Blanco cited by Bakhuizen (1921) and erroneously credited to Blanco, Fl. Filip., ed. 1, 512 (1837) is also an unfortunate error -- Blanco in the reference cited does not propose a binomial in the genus *Clerodendrum*, but *Volkameria grandiflora*, a synonym of *Clerodendrum macrostegium*. The *C. grandiflorum* of H. J. Lam is also a synonym of *C. macrostegium* Schau.

It should perhaps also be noted here that Jackson (1893) erroneously cites the original publication of *C. sagraei* as "Prodr. xi. 6591" instead of to page "695" and mistakenly dates Turczaninow's original description of *Aegiphila aurea* as "1868" instead of "1863". Paxton's 1847 work is also sometimes mistakenly cited as "1841".

Material of *Clerodendrum grandiflorum* has been misidentified and distributed in some herbaria as *C. cubense* Schau., *C. lindenianum* A. Rich., *Aegiphila* sp., and *Rondeletia* sp. On the other hand, some sheets of *Sagra s.n.*, distributed as *C. grandiflorum*, actually are *C. cubense* Schau.

Citations: CUBA: Havana: *Linden 131* (Ld--photo); *Sagra 50* (Ld--photo), *300* [Macbride photos 33934] (Dc F--969738--photo, Kr--photo, N--photo), *502* (P), *591* (Dc, Ld--photo, N--photo), *s.n.* (B, B, F--998438, P, V); *Serre s.n.* [1907] (B, B, Bg). Pinar del Río: *Acuña 10626* (Es, N), *10799* (Es), *16416* (Es), *16417* (Es), *18281* (Es), *18320* (Es); *Acuña & Alain s.n.* [Enero 2-4, 1952] (N); *Alain 110* (Ld), *488* (Ha), *4499* (W--2284635), *6875* (Mi), *s.n.* [León 20091] (Ha, Ha, N, N), *s.n.* [20 Decembre 1943] (Vi); *Alain & Killip 2008* (W--2110007); *C. F. Baker 3806* (B, N, W--523731); *Britton, Wilson, & León 13944* (F--459883, N, W--793598), *14124* (N, N, W--793620, W--793621); *Caldwell & Baker 7143* (B), *7145* (B); *Callardo s.n.* [León 17605] (N); *Charles 4998* (N); *Ekman 10405* (S), *10452* (S), *10495* (N), *12633* (E--photo), *12644* (B, Ld--photo, N--photo, S, W--211346), *16391* (B, S), *16620* (S), *17386* (B, S), *18158* (B, N, S, W--2113460); *León 6024* (Ha, N), *12540* (Ha), *12566* (Ha, N), *12640* (Ha, N), *12901* (Ha, N); *León & Charles 4975* (Ha, N); *León & Roca 7417* (Ha); *León &*

Victorin 20974 (Ha); *Marie-Victorin 49007* (Um--55106), *58263* (Um--55636); *Morton 4274* (W--1783407); *Roig 1139* (Es, F- 450824); *Roig & Van Hermann 1129* (Es); *Shafer 11909* (B, N, N, W--699518), *11911* (B, N, N, W--699520), *11986* (B, N, N, W--699599); *Van Hermann 3247* (B, Es); *P. Wilson 9207* (N, N). Province undetermined: *Auber s.n.* [Ins. Cuba] (D--612070); *Collector undetermined s.n.*(P); *C. Wright 502* [71; Herb. Sauvalle 1779 in part] (Hv, Hv, Hv, Hv, Hv, Hv), *502/1* [Herb. Sauvalle 1780] (Hv), *3175* in part [Herb. Sauvalle 1779 in part] (Hv), *3176* [1860-1864; Herb. Sauvalle 1780] (B, B, Bm, Ca--937199, Cb, E--118878, G, Hv, Hv, K, L, Ms--30953, Os, P, Pa, S, S, T, V, W--57703, X). ISLA DE PINOS: *Ekman 12503* (B, S). CULTIVATED: England: *Herb. Hooker s.n.* (K--type). MOUNTED CLIPPINGS & ILLUSTRATIONS: Alain in Leon & Alain, Fl. Cuba, imp. 2, 2: 320, fig.138. 1974 (Ld); Hook., Curtis Bot. Mag. 72 [ser. 3, 2]: pl. 4230. 1846 (Ld); Lemaire, Fl. Serres, ser. 1, 4: pl. 324. 1848 (Ld); Unidentified Vol. 13, pl. 154 (N); Urb., Symb. Antill. 6: 68--69. 1909 (S).

CLERODENDRUM GREVEI Mold., Amer. Journ. Bot. 38: 324--325. 1951.

Bibliography: Mold., Amer. Journ. Bot. 38: 324--325. 1951; Mold., Biol. Abstr. 26: 185. 1952; Mold. in Humbert, Fl. Madag. 174: 154, 229, 233--234, & 267, fig. 37 (10 & 11). 1956; Mold., Résumé 155 & 450. 1959; G. Taylor, Ind. Kew. Suppl. 12: 36. 1959; Mold., Fifth Summ. 1: 260 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 249 & 537. 1980; Mold., Phytologia 58: 189 (1985) and 59: 346. 1986.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 229, fig. 37 (10 & 11). 1956.

A shrub or tree; branchlets slender, grayish, rather prominently lenticellate, rather densely short-pubescent with twisted hairs on the younger parts, glabrescent in age; nodes more or less annulate; principal internodes 1.3--5.8 cm. long; leaf-scars rather small but borne on large and prominent ascending sterigmata to 3 mm. long on the younger parts; leaves decussate-opposite or ternate; petioles very slender, canaliculate above, about 10 mm. long, densely short-pubescent; leaf-blades submembranous, rather uniformly grayish-green on both surfaces, lanceolate, 6--8 cm. long, 1.5--2.3 cm. wide, apically acuminate, marginally entire, basally attenuate-acute or sub-acuminate, more or less densely short-pubescent above, less so in age except along the midrib, very densely short-pubescent throughout beneath; midrib very slender, very slightly prominulous above, prominulous beneath; secondaries very slender, 4--6 per side, arcuate-ascending, often very slightly subprominulous above, mostly obscured by the pubescence beneath; vein and veinlet reticulation very obscure or indiscernible on both surfaces; inflorescence terminal, cymose, 2--2.5 cm. long, 3--4 cm. wide, composed of numerous rather densely many-flowered cymes forming a very dense, sessile, convex inflorescence, the individual cymes stipitate on peduncle-like stalks that are very slender, to about 1 cm. long, densely short-pubescent like the upper part of the branchlets; bractlets and prophylla linear-setaceous, to about 3 mm. long, strigillose-pilose; pedicels obsolete or to 1 mm. long and pilosulous-pubescent; calyx campanulate, about 3 mm. long, rather sparsely pilose, its rim 4-

lobed, the lobes cuspidate; corolla hypocrateriform, its tube narrow-cylindric, about 7--8 mm. long, externally minutely pulverulent, nigrescent in drying, the limb about 4 mm. wide; stamens and pistil exserted; fruiting-calyx and fruit known only in an immature stage.

The species is based on *Grevé* 223 from somewhere in Madagascar and is deposited in the Paris herbarium. The pubescence and dense terminal inflorescences remind one strongly of *C. emirnense* Bojer. The species is known thus far (to me) only from the original collection.

A key to help distinguish this species from the other known taxa of *Clerodendrum* in Madagascar will be found under *C. baronianum* Oliv. in this present series of notes (58: 189).

Citations: MADAGASCAR: *Grevé* 223 (E--photo of type, F--photo of type, Ld--photo of type, N--fragment of type, N--photo of type, P--type).

CLERODENDRUM GRIFFITHIANUM C. B. Clarke in Hook. f., Fl. Brit. India 4: 590 [as "*Clerodendron*"]. 1885; H. Hallier, Meded. Rijks Herb. Leid. 37: 75. 1918.

Synonymy: *Clerodendron griffithianum* C. B. Clarke in Hook. f., Fl. Brit. India 4: 590. 1885.

Bibliography: C. B. Clarke in Hook. f., Fl. Brit. India 4: 590. 1885; Forbes & Hemsli., Journ. Linn. Soc. Lond. Bot. 26: 261. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; Stapf, Trans. Linn. Soc. Lond., ser. 2, 4: 216 (1894) and ser. 2, 4: 522. 1896; Brandis, Indian Trees, imp. 1, 507 (1906), imp. 2, 507 (1906), and imp. 2a, 507. 1907; Gamble in King & Gamble, Journ. Asiat. Soc. Beng. 74 (2 extra): 830. 1908; Brandis, Indian Trees, imp. 3, 507. 1911; Lévl., Cat. Pl. Yun-Nan 277. 1917; H. Hallier, Meded. Rijks Herb. Leid. 37: 75. 1918; Brandis, Indian Trees, imp. 4, 507. 1921; Rodger in Lace, List Trees Shrubs Burma, ed. 2, 132. 1922; Chung, Mem. Sci. Soc. China 1 (1): 228. 1924; P'ei, Mem. Sci. Soc. China 1 (3): 125 & 153--154. 1932; Kanjilal, Das, Kanjilal, & De, Fl. Assam, imp. 1, 486, 487, & 546. 1939; Biswas, Indian For. Rec. Bot., ser. 2, 3: 41. 1941; E. D. Merr., Brittonia 4: 171. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 54--56 & 90. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561. 1946; Mold., Alph. List Inv. Names Suppl. 1: 6. 1947; H. N. & A. L. Mold., Pl. Life 2: 62. 1948; Mold., Alph. List Cit. 2: 501 & 629 (1948), 3: 859 (1949), and 4: 1105. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 124, 126, 128, 131, & 181. 1949; Mold., Resume 159, 161, 165, 169, 264, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561. 1960; Hundley & Ko in Lace, Trees Shrubs Burma, ed. 3, 203. 1961; Rao & Joseph, Bull. Bot. Surv. India 7: 149. 1965; Rao & Verma, Bull. Bot. Surv. India 11: 410. 1969; Brandis, Indian Trees, imp. 5, 507. 1971; Mold., Fifth Summ. 1: 267, 272, 282, 287, & 446 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 259, 270, 272, 277, & 537. 1980; Kanjilal, Das, Kanjilal, & De, Fl. Assam, imp. 2, 3: 487. 1982; Mold., Phytologia 58: 404 (1985) and 59: 409. 1986.

A small pubescent tree or large bushy shrub, in habit resembling *C. disparifolium* Blume, but the branches viscous-pubescent; bark

greenish-white, with minute vertical lenticels, 2 mm. thick; blaze greenish; wood white; leaves decussate-opposite; petioles 0.8--2.5 cm. long, viscid-pubescent; leaf-blades membranous, oblong or elliptic to elliptic-lanceolate or lanceolate, 7.5--20 cm. long, 2.5--6 cm. wide, apically acuminate or caudate-acuminate, marginally entire or very obscurely and remotely toothed, basally obtuse to rounded or cuneate, glabrous or glabrate above when mature, minutely pubescent beneath, more densely so on the venation; secondaries 7 or 8 per side; inflorescence terminal or subterminal in the axils of the uppermost leaves, composed of lax, corymbiform-thyrsoïd, compound, viscid-pubescent, few-flowered cymes; peduncles penultimate from the axils of stipitate leaf-like bracts; bractlets filiform, about 1.2 cm. long; pedicels filiform, 6--12 mm. long; calyx campanulate, red, about 2.5 cm. long and 12 mm. wide, externally minutely pubescent, deeply 5-lobed, the tube short, the segments or lobes triangular-lanceolate, more or less reddish, 1.5 cm. long, apically acuminate; corolla white or yellow, hypocrateriform, glabrate or glabrescent, the tube 2.5--3.7 cm. long, slender, the lobes oblong, 8--9 mm. long; fruiting-calyx much enlarged, almost or quite enclosing the drupe, the segments triangular, incrassate, erect, about 12 mm. long, overtopping the drupe; fruit drupaceous, ovoid, about 1.2 cm. long and 1.8 cm. wide.

The species is based on *Griffith 6054* from Assam, India, deposited in the Kew herbarium. Clarke (1885) states that the species is also known from Aca in upper Burma. Rao & Joseph (1965) describe it as fairly common at 300 m. altitude in the Northeast Frontier region of India. Kanjilal and his associates (1939) list it from Lakhipur and Sibsagar in Assam, where, they say, it flowers from January to March and fruits in the "Hot season". Actually the species is native from Assam to Burma and north into Yunnan.

Collectors have encountered this plant in mixed evergreen and deciduous forests and subtropical hill forests, as well as along riversides, at 300--2600 m. altitude, in flower in November to March. On the label accompanying *Ward 155* it is stated that the plant was "in bud for second flowering". The corollas are said to have been "white" on *Keenan & al. 3634 & 3635* and *Ward 109* and "golden-yellow" on *Rock 7844*. Ward reports the plant "scattered but not rare in half-shade in gullies at the edge of jungles" in Burma. Merrill (1941) cites *Ward Vernay-Cutting Exped. 109 & 155* from Upper Burma.

A key for distinguishing *C. griffithianum* from other taxa in this genus growing in Assam is given by Kanjilal and his associates (1939) and this is reproduced here (with modifications and nomenclature updating by me):

1. Inflorescence subterminal.....*C. griffithianum*.
 - 1a. Inflorescence terminal.
2. Corolla-tube more than 7.5 cm. long.
 3. Corolla glabrous; leaf-blades lanceolate, glabrate.*C. indicum*.
 - 3a. Corolla pubescent; leaf-blades hastate, pubescent or vil-
lous.....*C. hastatum*.
- 2a. Corolla-tube less than 7.5 cm. long.
 4. Inflorescence corymbiform or capitate.

- 5. Corolla-tube less than 18 mm. long.
 - 6. Leaf-blades dentate; calyx-segments about 12 mm. long.....
C. viscosum.
 - 6a. Leaf-blades entire; calyx-segments only about 6 mm. long....
C. villosum.
 - 5a. Corolla-tube 2.5 cm. long.
 - 7. Leaf-blades subglabrous, basally shallowly cordate.....
C. colebrokianum.
 - 7a. Leaf-blades pubescent or tomentose, basally cuneate or rounded.*C. lasiocephalum.*
 - 7b. Leaf-blades villous or almost woolly beneath, basally cordate to cuneate.....*C. bracteatum.*
 - 4a. Inflorescence thyrsoid.
 - 8. Inflorescence erect.
 - 9. Calyx-rim truncate or with very short teeth.
 - 10. Leaves subsessile or with petioles only to 12 mm. long; bracts lanceolate, often whorled.....*C. serratum.*
 - 10a. Leaves plainly petiolate, the petioles to 3.7 cm. long; bracts ovate, opposite, foliaceous.....*C. venosum.*
 - 9a. Calyx divided almost to the base.....*C. kaempferi.*
 - 8a. Inflorescence pendulous.
 - 11. Leaf-blades glabrous; petioles 5--8 mm. long...
 - 11a. Leaf-blades sparsely pubescent; petioles to 15 cm. long....
C. macrostachyum.
- Brandis (1906) gives a partial key to the Indian species known to him, including *C. griffithianum*. Because it may also prove helpful, I reproduce it here with modifications and nomenclatural update:
- 1. Corolla-tube less than 4 cm. long.
 - 2. Cymes axillary.
 - 3. Leaf-blades glabrous or subglabrous.....*C. inerme.*
 - 3a. Leaf-blades pubescent.....*C. phlomidis.*
 - 2a. Inflorescence terminal.
 - 4. Inflorescence corymbiform or capitate.
 - 5. Corolla-tube less than 2 cm. long.
 - 6. Leaf-blades marginally entire.
 - 7. Corolla-tube 2--3 times as long as the calyx.
C. infortunatum.
 - 7a. Corolla-tube as long as or only slightly longer than the calyx.....*C. villosum.*
 - 6a. Leaf-blades marginally dentate.....*C. viscosum.*
 - 5a. Corolla-tube more than 2 cm. long.
 - 8. Cymes umbellate, conspicuously bracteose in pseudo-involucrate fashion, the bracts large, foliaceous, ovate.....
C. bracteatum.
 - 8a. Cymes paniculate, the bracts small, not involucrate.
 - 9. Panicle very densely flowered.
 - 10. Panicle corymbose; calyx-teeth small, at most 1 mm. long.....*C. colebrokianum.*
 - 10a. Panicle subcapitate; calyx-lobes large, triangular-lanceolate, at least 10 mm. long....*C. lasiocephalum.*
 - 9a. Panicle loosely flowered.....*C. garrettianum.*

4a. Inflorescence thyrsoid.

11. Thyrsi erect.

12. Thyrsus elongate; bracts conspicuous; calyx-teeth very short.

13. Leaves and bracts in pairs; petioles at least 2 cm. long; leaf-blades marginally generally subentire; inflorescence at most 15 cm. long.....*C. venosum*.13a. Leaves and bracts often ternate; petioles obsolete or very short; leaf-blades serrate or denticulate; inflorescence at least 15 cm. long.....*C. serratum*.

12a. Thyrsus lax, pyramidal; calyx divided nearly to the base.

14. Leaf-blades deeply lobed.....*C. paniculatum*.14a. Leaf-blades merely dentate.....*C. kaempferi*.

11a. Thyrsi drooping or nutant.

15. Corolla pale-blue.....*C. macrostachyum*.

15a. Corolla crimson.

16. Calyx-lobes oblong.....*C. nutans*.16a. Calyx-lobes broadly ovate.....*C. wallichii*.

1a. Corolla-tube mostly more than 7 cm. long.

17. Leaf-blades basally hastate, pubescent.....*C. hastatum*.17a. Leaf-blades not hastate, glabrous.....*C. indicum*.

Another key, this one to distinguish *C. griffithianum* from the other Chinese species, will be found under *C. henryi* P'ei in the present series of notes.

P'ei (1936) cites only *Anderson s.n.* and *Forrest 9599* from Yunnan, China, commenting that "This species is related to *Clerodendron trichotomum* Thung. and *C. nutans* Wall. It differs from the former by its oblong acuminate leaves and few flowered cymes, and from the latter by its erect inflorescences which are not elongated, and slender elongated corolla tube which is up to 3.5 cm. in length. It differs from *C. disparifolium* Bl. by its viscous-pubescence on the branches and leaves. Calyx densely pubescent without, glandular within. Corolla densely glandular without with traces of hairs. The axis of the panicle about 4 cm. in length."

Material of *C. griffithianum* has been misidentified and distributed in some herbaria as *C. bracteatum* Wall.

Citations: INDIA: Assam: *Simon s.n.* (Pd). BURMA: Upper Burma: *Griffith 6054* [Rehder photo 2088] (L--isotype, N--photo of type); *Keenan, Aung, & Hla 3634* (Lb--113380), *3635* (Lb--113382); *Kurz 1041* (L); *Rock 7469* (Ca--328488, N, W--1511098); *Shack Mohin s.n.* [Kachin Hills] (Mu--3735); *F. K. Ward 109* (N), *155* (N). CHINA: Yunnan: *Rock 7844* (W--1511099), *7849* (W--1511733).

CLERODENDRUM GUERKEI J. G. Baker in *Thiselt.-Dyer, Fl. Trop. Afr.* 5: 308 [as "*Clerodendron*"]. 1900; B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 61 & 93 [as "*Gürkei*"] in syn. 1936.

Synonymy: *Clerodendron guerkei* Baker in *Thiselt.-Dyer, Fl. Trop. Afr.* 5: 308. 1900. *Clerodendron rotundifolium* Gürke ex J. G. Baker in *Thiselt.-Dyer, Fl. Trop. Afr.* 5: 309 in syn. 1900 [not *C. rotundifolium* Oliv., 1875]. *Clerodendron zambesiaceum* Baker in *Thiselt.-*

Dyer, Fl. Trop. Afr. 5: 309. 1900. *Clerodendrum glirkei* Baker apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 61 & 93 in syn. 1936. *Clerodendrum zambesiicum* Baker apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 36, 62, & 93. 1936. *Clerodendron yambesiicum* Baker ex Mold., Phytol. Mem. 2: 390 in syn. 1980.

Bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 294 & 308--309. 1900; K. Schum., Justs Bot. Jahresber. 28 (1): 495. 1900; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 43 & 44. 1904; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 36, 61, 62, 93, & 96. 1936; Mold., Prelim. Alph. List Inv. Names 22. 1940; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 44, 51, & 90. 1942; Mold., Alph. List Inv. Names 21. 1942; Mold., Alph. List Cit. 1: 74 (1946) and 2: 556 & 614. 1948; H. N. & A. L. Mold., Pl. Life 2: 62. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 116, 120, & 181. 1949; Mold., Résumé 144, 149, 271, & 450. 1959; Mold., Résumé Suppl. 9: 3. 1964; Grout de Beaufort & Schnell, Mem. Inst. Fond. Afr. Noire 75: 41 & 42. 1966; Mold., Résumé Suppl. 13: 4. 1966; Mold., Fifth Summ. 1: 235, 249, 251, 446, & 460 (1971) and 2: 777 & 866. 1971; Gibbs, Chemotax. Flow. Pl. 3: 1753 (1974) and 4: 2080. 1974; Mold., Phytologia 34: 442 (1974) and 34: 273. 1976; Mold., Phytol. Mem. 2: 218, 225, 238, 240, 386, 390, & 537. 1980; Mold., Phytologia 57: 346. 1985.

An erect shrub or small tree, 1--10 m. tall, growing in groups; stems single, erect, hollow; sap colorless; branchlets finely hairy; leaves decussate-opposite, long-petiolate; leaf-blades moderately firm, broadly cordate-ovate, 7.5--15 cm. long, apically acute, marginally entire, basally deeply cordate, slightly pubescent above, densely pubescent beneath; inflorescence axillary, cymose, the cymes lax, forming a small panicle; pedicels sometimes 2.5 cm. long, densely pubescent; flowers aromatic; calyx campanulate, very pubescent, 1.2 cm. long, the lobes ovate, as long as the tube, apically acute; corolla hypocrateriform, the tube slender, 10 cm. long, the lobes obovate, 1.2 cm. long; stamens much exserted.

This species is based on *Holst 8908a* from Kwa Mshuza, Usambara, Tanganyika (Tanzania); *C. zambesiicum* is based on *Buchanan 332* & *359* and *Kirk s.n.* from Nyasaland (Malawi), and of these Thomas (1936) has designated *Buchanan 359* as the type. For some reason not obvious to me, he cites *Schlieben 1079* from Tanganyika as a "Cotypus".

Collectors have encountered *C. guerkei* on black loam soil, in grass around palm groves, in parkland association vegetation, and in dry montane *Albizzia* forests, at 900--1500 m. altitude, in flower in February, March, September, and November. Schlieben refers to it as abundant or very common in brook valleys in Tanganyika.

The corollas are said to have been "white" on *Schlieben 1759* & *2751*, *Tanner 1664*, and *Torre & Paiva 10992*. The wood is reported to be used as sticks and posts in Tanganyika. Gibbs reports cyanogenesis absent from the leaves and also secured negative results (with a faint blue fluorescence) from the Juglone test of leaves and bark.

Thomas (1936) regards *C. guerkei* as a synonym of *C. rotundifolium* Oliv. and cites for *C. zambesiicum* only *Buchanan 359* from Nyasaland and *Brehmer 1733*, *Engler 1475*, *Holst 414*, *Holtze 836*, *Schlieben 1079*,

1759, & 2751, Stolz 78, and Stuhlmann 8900 & 9049 from Tanganyika.

The Tanner 1664 collection, cited below, was annotated at Kew as a "pubescent var." of *C. hildebrandtii* Vatke.

Baker (1900) distinguished his *C. guerkei* from *C. zambesiaceum* merely by saying that in the former the calyx is "medium-sized", while in the latter it is "large". His key to the non-capitate large-flowered tropical west African species of this genus known to him is as follows:

1. Panicles small.
 2. Leaf-blades oblanceolate-oblong, marginally deeply toothed.....*C. incisum*.
 - 2a. Leaf-blades orbicular, not cordate.....*C. rotundifolium*.
 - 2b. Leaf-blades cordate, broadly ovate.
 3. Calyx small.....*C. greyi*.
 - 3a. Calyx medium-sized.
 4. Corolla-tube $1\frac{1}{2}$ inches long.....*C. welwitschii*.
 - 4a. Corolla-tube 4 inches long.....*C. guerkei*.
 - 3b. Calyx large.
 5. Leaf-blades marginally entire.
 6. Leaves finely pubescent.....*C. zambesiaceum*.
 - 6a. Leaves velvety.....*C. stuhlmannii*.
 - 5a. Leaf-blades marginally repand.....*C. poggei*.
 - 1a. Panicles large, thyrsoid.....*C. thyrsoides*.

[It should be pointed out that, in my opinion, the correct name for what Baker calls *C. greyi* in the above key is *C. speciosissimum* Van Geert, while his *C. zambesiaceum* is the same as *C. guerkei* J. G. Baker, *C. stuhlmannii* is *C. rotundifolium* var. *stuhlmannii* (Gürke) Thomas, and *C. poggei* is *C. angolense* Gürke].

The *Habin s.n.* [25/12/1928], distributed as *C. guerkei* actually is *C. rotundifolium* Oliv.

Citations: ZAIRE: Germain 8208 (E--2168593). TANZANIA: Tanganyika: Schlieben 1759 (Br, Mu, N, S), 2751 (B, Br, Ld--photo, Mu, N, N--photo, S); Tanner 1664 (N). MALAWI: Buchanan 332 (L, L, N--photo, W--806806); Stolz 614 (S). MOZAMBIQUE: Niassa: Torre & Paiva 10992 (U1).

CLERODENDRUM HAEMATOLASium H. Hallier, Meded. Rijks Herb. Leid. 37: 69--71. 1918.

Synonymy: *Clerodendron haematolasium* Hall. f. apud H. J. Lam, Verbenac. Malay. Arch. 286 & 363. 1919. *Clerodendron haematoplasium* Hall. f. ex E. D. Merrill, Bibl. Enum. Born. Pl. 616. 1921. *Clerodendron macrophyllum* var. *haematolasium* Bakh. in herb.

Bibliography: H. Hallier, Meded. Rijks Herb. Leid. 37: 69--71. 1918; H. J. Lam, Verbenac. Malay. Arch. 286 & 363. 1919; Bakh. in lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 95, 109, & ix. 1921; E. D. Merrill, Bibl. Enum. Born. Pl. 616. 1921; A. W. Hill, Ind. Kew. Suppl. 6: 49. 1926; Mold., Alph. List Inv. Names 17. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 90 (1942) and ed. 2, 146 & 181. 1949; Mold., Résumé 192, 193, 264, & 450. 1959; Mold., Fifth Summ. 1: 322 & 446 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 313 & 537. 1980; Mold., Phytologia 50: 253 (1982) and 58:

415. 1985.

An herb or shrub, to 1.7 m. tall, with the habit, leaves, and form of the calyx reminiscent of *C. phyllomega* Steud.; stems [or branches?] terete, 2.5--8 mm. wide, at first densely hirsute with weak, spreading, maroon or rose-purple (finally sordid gray-brown), transversely septate hairs, eventually glabrate and pale-gray; leaves decussate-opposite; petioles 2--9 cm. long, subterete, more or less deniculate at the base and apex, obsoletely sulcate above, densely fuscous-hirsute like the branches; leaf-blades large, membranous, obovate-lanceolate, 11--35 cm. long, 5.5--17 cm. wide, similar in form and indument to *Cyrtandra*, apically more or less long-acuminate, marginally rather remotely and shortly sinuate-dentate except at the very base, basally acute or narrowly subrotundate, shiny dark-green and often covered with epiphytic hepatics above, somewhat less shiny and paler green or violet beneath, pubescent on both surfaces, not at all or only obsoletely glandular-punctulate beneath but larger glands not present; midrib and secondaries more densely bristly-hirsute beneath; vein and veinlet reticulation lax, sharply prominent beneath; inflorescence terminal, paniculate, thyrsoïd, to 14 cm. long (including the short peduncles) and 6 cm. wide, densely hirsute like the stems; bracts linear or sub lanceolate; pedicels 5--7 mm. long, shorter than or subequaling the calyx; calyx in anthesis herbaceous, 12--14 mm. long, externally shiny bright-red and more or less densely purple-hirsute, internally shiny crystalline greenish-white, deeply 5-fid, the sinuses acute, the lobes 1 cm. long, apically acutely acuminate; corolla hypocrateriform, reddish to rose-purple as in *Rubus odoratus*; fruiting-calyx incrassate, 1.8--2 cm. long, loosely surrounding the drupaceous, green, immature fruit.

This species is based on Hallier B.465, 2628, 2864, 2881, 2885, 2886, 2934, 3019, 3114, & 3151 from western Borneo. Hallier (1918) describes the plant as "Stengel, Blatt- und Blütenstiele, Kelch und Unterseite der Mittel- und Fiedernerven dicht mit *Rubus odoratus*-rothen, im Alter schmutzig braungrauen abstehenden Haaren bedeckt. Blätter weich und krautig, oberseits glänzend dunkelgrün, unterseits etwas schwächer glänzend violett, mit stark vorspringendem weitmaschigen Adernetz und trübgrünem, abstehend borstig roth behaartem Mittelnerven. Der 5-lappige Kelch aussen glänzend lebhaft roth, innen krystakkinisch glänzend weissgrün, bisweilen in's Röthliche spielend, nach der Spitze zu mit zerstreuten, rothen, schräg vorn gerichteten Borsten besetzt, die schwach glasglänzende hellgrüne junge Frucht umschliessend." He also suggests that "an sylvae pluvialis pl. cleistogama?" In another place he describes the hairs on the stems, petioles, calyx, and lower leaf-surface as *Amaranthus*-red.

Collectors have found this plant growing on hillsides and in hill-top jungles and humus-rich high forests with *Quercus wilhelmianae* Seem., *Q. argentea* Korth., *Q. pulchra* King, *Q. cyclophora* Endl., *Q. ewyckii* Korth., and *Gardenia anisophylla* var. *polyneura* Valet., at 650--1800 m. altitude, in flower in January, April, May, October, and November, and in fruit in January, May, and November.

The corollas are described as having been "white-yellow" [=yellow-

ish-white?] on Abas SAN.85700, "green covered with red hairs" on Cockburn & Saikel SAN.70030, "cream" on Clemens & Clemens 4967, "greenish-cream" on Clemens & Clemens 26909, and "red like those of *Rubus odoratus*" on Hallier B.465.

Merrill (1921 cites only Hallier 465 & 2934 from Dutch Borneo.

In view of the wide discrepancies in described corolla-color, it is quite possible that two color-forms are here involved.

Material has been misidentified and distributed in some herbaria as *C. disparifolium* var. *kinabaluense* (Stapf) Bakh. and as *Rubiaceae*.

Citations: GREATER SUNDA ISLANDS: Kalimantan: Endert 3210 (Bz--72726), 4423 (Bz--72746); H. Hallier B.465 (Bz--1920--cotype), B.2934 (Bz--19203--cotype, Ca--236924--cotype), B.3151 (Bz--19204--cotype, Ld--photo of cotype, N--cotype, N--photo of cotype). Sabah: Abas SAN.85700 (Sn--54458); M. S. Clemens 10087 (Bz--19201, N--photo); Clemens & Clemens 4967 (Bz--19195), 26909 (Bz--19198, N), 31262 (Bz--19205), s.n. [Jan. 27, '31] (N), s.n. [30.XI.1931] (Bz--19196), s.n. [10.V.1932] (Bz--19197); Cockburn & Saikel SAN.70030 (Sn--35679); Moulton 6698 (Bz--19199); M. Ramos s.n. [Sandakan and vicinity] (Bz--19200).

CLERODENDRUM HAHNIANUM Dop in Lecomte, Notul. Syst. 4: 13 [as "*Clerodendron*"]. 1920; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942.

Synonymy: *Clerodendron hahnianum* Dop in Lecomte, Notul. Syst. 4: 13. 1920.

Bibliography: Dop in Lecomte, Notul. Syst. 4: 13. 1920; A. W. Hill, Ind. Kew. Suppl. 6: 49. 1926; Fedde & Schust., Justs Bot. Jahresber. 48 (1): 497. 1927; Dop in Lecomte, Fl. Gén. Indo-chine 4: 851 & 869. 1935; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 62. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 138 & 181. 1949; Mold., Résumé 175 & 450. 1959; Mold., Fifth Summ. 1: 299 (1971) and 2: 866. 1971; Mold., Phytologia 31: 395. 1975; Mold., Phytol. Mem. 2: 288, 386, & 537. 1980; Mold., Phytologia 59: 238, 412, 470, 482, & 483 (1986) and 60: 66. 1986.

A shrub; branches tetragonal, canaliculate, rather densely pubescent; bark red; nodes annulate with an interpetiolar row of lanate hairs; leaves decussate-opposite; petioles stout, 8--12 mm. long, pubescent; leaf-blades chartaceous or subcoriaceous, oblong-lanceolate, arcuate, 5--13 cm. long, 1--2.5 cm. wide, apically acute, marginally entire, basally cuneate, sparsely pilose above, softly villous beneath; midrib prominent; secondaries 12--14, recurved; vein and veinlet reticulation irregular, only slightly distinct; inflorescence axillary and terminal, paniculate, many-flowered, about 25 cm. long and 17 cm. wide, di- or trichotomous, the cymes racemiform; bracts arcuate; bractlets subulate; pedicels 4--8 mm. long; calyx turbinate, herbaceous, green, 5 mm. long, externally villous, the tube 1.5 mm. long, the lobes lanceolate, 3--3.5 mm. long, apically acute; corolla hypocrateriform, 2.5--3 cm. long, externally puberulent, the tube filiform, 1.6--1.7 cm. long, the lobes equal, oblong, 8--13 mm. long; stamens long-exserted; anthers oblong; style slen-

der; stigma shortly bifid; ovary subglobose, externally glabrous; fruiting-calyx accrescent, red; fruit drupaceous, subglobose, 1--2 cm. long, 1--3 cm. wide, black when mature; pyrenes two.

This species is based on an unnumbered Hahn collection from Cambodia and is known thus far (to me) only from the original collection. Dop (1930) says of it "Cette espèce est voisine des *Cl. Godefreyi* O. Ktze et *Cl. Lloydianum* Craib. Elle s'en distingue par le port, les feuilles arquées et la pilosité"; in his 1935 work he distinguishes it from the other Indochinese taxa known to him by the following key (modified and nomenclaturally updated by me):

1. Corolla-tube to 10 cm. long.....*C. indicum*.
- 1a. Corolla-tube only to about 5 cm. long.
 2. Calyx-rim truncate, entire or very shortly denticulate.
 3. Cymes axillary, simple, 3-flowered; leaf-blades marginally entire.....*C. inerme*.
 - 3a. Cymes terminal, paniculate, many-flowered; leaf-blades marginally dentate or denticulate.
 4. Ovary externally velutinous; floriferous stems separate, leafless, 50 cm. long.....*C. subscaposum*.
 - 4a. Ovary externally glabrous; floriferous stems not separate from the others, leafy.....*C. serratum*.
- 2a. Calyx distinctly dentate or lobed.
 5. Inflorescence terminal, dense, capitate, umbellate, or in many-flowered panicles.
 6. Inflorescence dense, capitate, umbellate, or globular; bracts foliaceous
 7. Calyx with round peltate glands.
 8. Calyx glabrous, puberulent, or pubescent, with only 3--5 peltate glands.
 9. Peltate glands irregularly disposed.
 10. Calyx-lobes triangular, apically acute.
 11. Bracts persistent, longer than the calyx; corolla white or pale-rose.....*C. philippinum*.
 - 11a. Bracts caducous, equaling the calyx; corollas red.....*C. bungei*.
 - 10a. Calyx-lobes large, oval, foliaceous..*C. viscosum*.
 - 9a. One peltate gland at the base of each calyx-tooth...
C. colebrokianum.
 - 8a. Calyx silky-velutinous, with a large number of peltate glands.....*C. villosum*.
 - 7a. Calyx without peltate glands.....*C. canescens*.
 - 6a. Inflorescence loosely paniculate, racemiform, or corymbiform; bracts generally small.
 12. Leaf-blades with rounded glands beneath
 13. Leaf-blades marginally entire or simply dentate.....
C. kaempferi.
 - 13a. Leaf-blades 3--7-lobed.
 14. Lobes triangular, not deeply separated; corolla 2--2.5 cm. long.....*C. paniculatum*.
 - 14a. Lobes linear-oblong, deeply separated; corollas 1.2--1.5 cm. long.....*C. palmatilobatum*.

- 12a. Leaf-blades not glandulose beneath.
15. Flowering calyx membranous, green, externally pubescent or puberulent.
16. Calyx more than 1 cm. long.
17. Corolla puberulent.....*C. longisepalum*.
- 17a. Corolla silky-pubescent.....*C. calamitosum*.
- 16a. Calyx not over 8 mm. long.
18. Leaf-blades glabrous beneath except for the venation.
19. Calyx 7 mm. long; leaf-blades with 14--18 distant secondaries.....*C. garrettianum*.
- 19a. Calyx only 4 mm. long; leaf-blades with 20--32 close secondaries.....*C. tonkinense*.
- 18a. Leaf-blades pubescent or villous beneath.
20. Leaf-blades villous beneath.....*C. hahnianum*.
- 20a. Leaf-blades simply pubescent beneath.
21. Panicles to 40 cm. long; sepals apically acuminate.....*C. finetii*.
- 21a. Panicles not more than 10 cm. long; sepals apically acute.
22. Leaf-blades 10--18 cm. long; corollas 3.5 cm. long.*C. godefroyi*.
- 22a. Leaf-blades only 2--3 cm. long; corollas 2--2.3 cm. long.....*C. lloydianum*.
- 15a. Calyx chartaceous or coriaceous, brown, yellow, rose, or red.
23. Calyx-lobes broadly oval-lanceolate; panicles pendent.....
C. nutans.
- 23a. Calyx-lobes triangular-acute.
24. Flowering calyx more than 1 cm. long.
25. Calyx red-lilac; corolla-lobes 8--9 mm. long.....
C. petasites.
- 25a. Calyx not red; corolla-lobes only 5 mm. long.....
C. gaudichaudii.
- 24a. Flowering calyx less than 1 cm. long.
26. Inflorescence loose, corymbiform, the ramifications divaricate.
27. Leaf-blades glabrous beneath.....*C. cyrtophyllum*.
- 27a. Leaf-blades cinereous-velutinous beneath.....
C. mandarinorum.
- 26a. Inflorescence paniculate, longer than wide, racemiform, the ramifications brachiate.
28. Leaf-blades basally acute.
29. Leaf-blades oblanceolate, basally long-attenuate..
C. lecomtei.
- 29a. Leaf-blades oboval, basally simply acute.....
C. lanessanii.
- 28a. Leaf-blades basally truncate, cordate, or hastate.
30. Petioles villous.
31. Panicles 14 cm. long.....*C. schmidtii*.
- 31a. Panicles only 7 cm. long...*C. hastato-oblongum*.
- 30a. Petioles glabrous or glabrescent.

cinni; calyx campanulate, chartaceous, green or reddish-purple, papillose, the tube short, the lobes ovate-lanceolate, 4 mm. long, apically acute; corolla hypocrateriform, white or cream-color, sometimes pink-tinged, sparsely papillose and glandulose with subsessile glands, the tube filiform, to 2 cm. long, the limb when unopened subincurved-pyriform and 8 mm. long, when open with lobes rounded, 4 broadly elliptic, 7 mm. long and 3 mm. wide, the fifth one oblong, 1 cm. long and 4 mm. wide; stamens long-exserted; filaments to 17 mm. long; anthers oblong, to 2 mm. long, pink or purple-spotted; style shorter than the stamens; stigma bilobed, the branches slender; fruiting-calyx deep-purple; fruit drupaceous, at first green, finally black when mature.

This species is based on *Ford 424* collected in Hainan in 1893. Handel-Mazzetti (1931) cites also *Fenzl 93, 100, & 272* from the same island, the first two collected in October to November, 1929, "in regione inferiore silvae primaevae montis Hungmoleng, versus 700 m" and the third "in planitie Bodeng." He comments: "proximum *C. petasites* (Lour.) Moore in Journ. of Bot., LXIII., 285 etiam in prov. Yunnan australi obvium (*Henry 11,585 B*) differt foliis sinuatis et remote denticulatis et calycibus maioribus. Die Form der Korolle stellt diese Art in die Sektion *Siphonanthus*, obwohl sie wesentlich kleiner ist, als bei den anderen hierher gestellten Arten. Auf das Merkmal der Grösse hin wäre die Sektion aber wohl nicht als natürlich zu betrachten."

The species has been found growing in sandy soil of forests, along the margins of streams, in partial or dense shade of forested ravines, in dense forests and light woods, and in shady mixed forests on mountaintops and plains, at altitudes of 500--800 m., in flower in September, October, and December, and in fruit in October, December, and February. Lau reports it "rare in moist loam of thickets on gentle slopes" and "fairly common in clay of thickets on steep dry slopes".

The corollas are said to have been "white" on *How 73992*, *Lau 560*, and *Liang 63444 & 63468*, "cream" or "creamy-white" on *Liang 63178*, and "white and pale-red" on *Liang 66223*.

The *Wang 33899*, distributed as *C. hainanense*, actually is *C. cyrtophyllum* Turcz.

Citations: CHINESE COASTAL ISLANDS: Hainan: *Chun & Tso 43984* (N), *44582* (N, W--1675379); *How 73924* (Bi, S), *73992* (S); *Lau 560* (B, Ca--524971, I, Mi, N, W--1629515), *1081* (N), *2914* (Bi, S); *Lei 170* (N); *Liang 63178* (Mi, Mu, N, S, W--1671013), *63444* (Mi, Mu, N), *63468* (N, W--1671075), *64850* (N), *66191* (Go, N), *66223* (N), *66528* (N, S); *Wang 34193* (N, S, W--1670361), *35242* (Go, N).

CLERODENDRUM HARMANDIANUM Dop in Lecomte, Notul. Syst. 4: 13 [as "*Clerodendron*"]. 1920; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942.

Synonymy: *Clerodendron harmandianum* Dop in Lecomte, Notul. Syst. 4: 13. 1920.

Bibliography: Dop in Lecomte, Notul. Syst. 4: 13. 1920; A. W. Hill, Ind. Kew. Suppl. 6: 49. 1926; Fedde & Schust., Justs Bot. Jah-

resber. 48 (1): 497. 1927; Dop in Lecomte, Fl. Gén. Indo-chine 4: 853 & 882. 1935; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 59 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 63. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 136 & 181. 1949; Mold., Résumé 175 & 450. 1959; Mold., Fifth Summ. 1: 299 (1971) and 2: 866. 1971; Mold., Phytologia 31: 395. 1975; Mold., Phytol. Mem. 2: 291, 386, & 537. 1980.

A shrub (?); branches terete, at first finely pubescent, eventually glabrous; bark shiny, light-brown; leaves decussate-opposite; petioles 3--6 cm. long, finely pubescent, apically subulate and 2--3 mm. wide; leaf-blades membranous or herbaceous, obovate, 14--18 cm. long, 4--5 cm. wide, apically short-acuminate, marginally dentate on the upper two-thirds, basally attenuate and slightly decurrent into the petiole, glabrous above, finely pubescent (especially on the venation) beneath; midrib stout; secondaries 8 or 9 per side, very slender, ascending; tertiaries subparallel; veinlet reticulation distinct, conspicuous beneath; inflorescence unknown, except for the immature calyx in bud, which is turbinate, herbaceous, green, externally pubescent, its tube short, the lobes lanceolate, apically acute.

This poorly known species is based on *Harmand 832* from Pulo-Condor, Cochinchina, Vietnam. Because it is so poorly known, Dop has omitted it from his key to the Indochinese taxa of *Clerodendrum* known to him. Nothing is known to me, either, of this plant beyond what is stated in its meager bibliography (above).

CLERODENDRUM HARNIERIANUM Schweinf. ex Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 1: 119 [as "*Clerodendron*"]. 1867; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 38, 67, & 93. 1936.

Synonymy: *Clerodendron harnierianum* Schweinf. ex Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 1: 119. 1867.

Bibliography: Aschers. in G. Schweinf., Beitr. Fl. Aethiop. 1: 119 & 278. 1867; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; J. G. Baker in Thiselet.-Dyer, Fl. Trop. Afr. 5: 293 & 301. 1900; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 38, 67, & 93. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 45 & 90. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561. 1946; H. N. & A. L. Mold., Pl. Life 2: 63. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 109 & 181. 1949; Mold., Résumé 132, 133, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561. 1960; Mold., Fifth Summ. 1: 209 & 210 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 199, 201, & 537. 1980; Mold., Phytologia 59: 254. 1986.

A small subshrub; branchlets herbaceous, tetragonal; leaves decussate-opposite or ternate, petiolate; leaf-blades membranous, oblong or oblong-lanceolate, about 5 cm. long and 2.5 cm. wide, apically narrowed and acute, basally narrowed, pubescent on both surfaces; inflorescence terminal, paniculate, composed of loose cymes, the ramifications pubescent; pedicels slender, pubescent; calyx campanulate, about 8 mm. long, glabrate, the lobes ovate-lanceolate, as long as the tube, apically very acute; corolla purple, 2--3 times as

long as the calyx, pubescent, the tube 2--2.5 cm. long; anthers roundish.

This species is based on an unnumbered Harnier collection from along the White Nile in Ethiopia, collected in 1861, and one of Cienkowski from Rosares in Sennar, Sudan, collected on May 8, 1848.

Ascherson (1867) comments that "Die Behaarung wechselt in Dichtigkeit nicht nur bei verschiedenen Theilen der Pflanze, sondern auch bei den Exemplaren. Der Stengel ist entweder kahl und scharfkantig, oder die Kanten desselben sind etwas abgerundet und mehr oder minder behaart. Die Blattlänge überschreitet an meinen Exemplaren nicht 2", die Breite nicht 1" rhein. Der Blattstiel hat $\frac{1}{2}$ -- $\frac{3}{4}$ der Blattlänge. Die Zuspitzung der Blätter ist vorn und hinten meistens fast gleich, selten an der Basis stumpfer. Sehr verschieden ist die Länge der Blütenstielchen. Dieselbe beträgt an manchen Exemplaren nur $\frac{1}{4}$ ", bei anderen dagegen erreicht sie 1 $\frac{1}{4}$ ". Der zu Hälfte getheilte Kelch hat eine Gesamtlänge von 9--10 Millim. Die Zipfel sind 2--2 $\frac{1}{2}$ Millim. breit. Die Länge der purpurnen Blütenröhre beträgt $\frac{3}{4}$ und 1" rhein. Die Staubfäden sind nicht viel kürzer als die Blumenröhre.

"Bemk. Da ich weder unter den afrikanischen noch unter den übrigen Arten dieser Gattung eine fand, welche auch nur im Entferntesten mit der vorliegenden Pflanze verwechselt werden könnte, so entschloss ich mich, obgleich mir kein reichliches Material zu Gebote steht und in Folge dessen oben gegebene Beschreibung vielleicht sehr mangelhaft sein mag, dieselbe zu einer neuen Art zu erheben, welche ich dem Andenken des unglücklichen Nil-Reisenden widme, dessen eifriger Strebsamkeit ein unheltvolles Jagdgeschick in der Blüthe seiner Jahre ein Ende machte. Die beschriebene Art gehört unstreitig zum §. 1 der Schauerschen Monographie dieser Gattung und ist von allen gekannten Arten durch die wenigen Merkmale, die ich angeführt habe, hinlänglich unterschieden. Das *C. Harnierianum* ist sogar in dem Grade eigenthümlich, dass ich nicht im Stande bin, die nächsten verwandtschaftlichen Beziehungen zu anderen afrikanischen oder indischen Arten anzugeben. *Cl. phlomoides* L. hat zwar der Kelch, *Cl. tomentosum* R. Br. zwar die Corolle, was Grösse und Gestalt anbelangt, mit unsere Art gemein. Allein in allen übrigen Stücken machen sich die stärksten Verschiedenheiten geltend."

Thomas (1936) cites Cienkowski 188, Figari s.n., and Harnier s.n. from the Sudan, but he places the Cienkowski collection from near Rosares in Egypt rather than Sudan.

A key to help distinguish this species from some of its tropical African relatives will be found under *C. dinklagei* Gürke in the present series of notes (59: 254).

Nothing is known to me of *Clerodendrum harnierianum* beyond what is given in its sparse bibliography (above).

CLERODENDRUM HASTATO-OBLONGUM C. B. Clarke in Schmidt, Bot. Tidsskr. 26: 174 [as "*Clerodendron*"]. 1904; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 90. 1942.

Synonymy: *Clerodendron hastato-oblongum* C. B. Clarke in Schmidt, Bot. Tidsskr. 26: 174. 1904.

Bibliography: C. B. Clarke in Schmidt, Bot. Tidsskr. 26: 174. 1904; F. N. Williams, Bull. Herb. Boiss., ser. 2, 5: 431. 1905; Prain, Ind. Kew. Suppl. 3: 44. 1908; Dop in Lecomte, Fl. Gen. Indochine 4: 852, 877--878, & 881. 1935; Fletcher, Kew Bull. Misc. Inf. 1938: 428. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 90 (1942) and ed. 2, 137 & 181. 1949; Anon., Kew Bull. Gen. Ind. 77. 1959; Mold., Résumé 177 & 450. 1959; Mold., Résumé Suppl. 6: 8. 1963; Mold., Fifth Summ. 1: 446. 1971; Mold., Phytologia 52: 124 & 128 (1982) and 59: 484. 1986.

Clarke's original (1904) description of this species is merely: "Petioli 8 cm. longi. Folii lamina basi truncata hastata. Panicula subglobosa, 6--7 cm. in diam., 12--16 flora. Calycis lobi ovati acuti. Ceteroquin ut *C. Schmidtii*, hujusque forsan var. *umbrosa*, foliis tenuioribus, pedunculo gracillimo. Jungle near Klong Son, a shrub (No. 692a)." Williams (1905) cites only the type collection.

Shimizu and his associates encountered this plant in tropical rainforests, at 600 m. altitude, in flower in October.

Dop (1935) claims that *C. hastato-oblongum* is also closely allied to *C. geoffrayi* Dop. Fletcher (1938) reduces it to synonymy under *C. schmidtii* and in this disposition of it I concurred in my earlier publications. A key to help distinguish it from most of its Indo-chinese relatives will be found under *C. hahnianum* Dop in the present series of notes (60: 142).

Citations: THAILAND: Shimizu, Toyokuni, Koyama, Yahara, & Santisuk T.18124 (Ac).

CLERODENDRUM HASTATUM Wall. ex Lindl., Edwards Bot. Reg. 16: pl.

1307 [as "*Clerodendron*"]. 1830; Loud., Hort. Brit., ed. 1, 247. 1830.

Synonymy: *Siphonanthus hastata* Roxb., Hort. Beng., imp. 1, 46 nom. nud. 1814; Fl. Indica, ed. 2, imp. 1, 3: 67--68. 1832. *Clerodendron sagittatum* Wall., Numer. List [49], no. 1786 hyponym. 1828. *Clerodendron hastatum* Wall. ex Lindl., Edwards Bot. Reg. 16: pl. 1307. 1830. *Siphonanthus hastatus* Roxb. apud Wall., Numer. List 86, no. 1786. 1831. *Clerodendron hastale* Edgeworth, Pollen, ed. 1, 26, pl. 2 (20). 1877. *Clerodendron hastatum* Lindl. apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 595. 1885. *Clerodendron hastatum* (Roxb.) Lindl. apud Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 86. 1921. *Clerodendrum hastatum* (Roxb.) Wall. ex Mold., Résumé 159, 161, 216, 264, 268, 341, & 450. 1959. *Clerodendrum hastatum* (Roxb.) Lindl. ex Backer & Bakh., Fl. Java 2: 608. 1965.

Bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; Wall., Numer. List [49], no. 1786. 1829; Lindl., Edwards Bot. Reg. 16: pl. 1307. 1830; Loud., Hort. Brit., ed. 1, 247. 1830; Sweet, Hort. Brit., ed. 2, 415. 1830; Wall., Numer. List 86, no. 1786. 1831; Loud., Hort. Brit., ed. 2, 274. 1832; Roxb., Fl. Indica, ed. 2, imp. 1, 3: 67--68. 1832; W. Hook., Curtis Bot. Mag. 62 [ser. 2, 9]: pl. 3398. 1835; G. Don in Loud., Hort. Brit., ed. 3, 247. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 550. 1839; Steud., Nom. Bot. Phan., ed. 2, 383. 1840; Voigt, Hort. Suburb. Calc. 465. 1845; Walp., Repert. Bot. Syst. 4: 102. 1847; Schau. in A. DC., Prodr. 11: 671. 1847; Buek,

Gen. Spec. Syn. Cando11. 3: 106. 1858; Bocq., *Adansonia*, ser. 1 [Baill., *Rec. Observ. Bot.*], 2: 14, 40, 94, 120, & 144, pl. 8, fig. 26--28 (1862) and ser. 1, 3: 214. 1863; Bocq., *Rév. Verbenac.* 14, 40, 94, 120, & 144, pl. 7. 1863; Firminger, *Man. Gard. India*, ed. 3, 529 & 609. 1874; Roxb., *Fl. Indica*, ed. 2, imp. 2, 480 & 481. 1874; Edgeworth, *Pollen*, ed. 1, 26, pl. 2 (20) (1877) and ed. 2, 26, pl. 2 (20). 1879; C. B. Clarke in Hook. f., *Fl. Brit. India* 4: 595--596. 1885; André, *Rev. Hort.* 65: 60. 1893; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 516 (1893) and imp. 1, 2: 916. 1895; Briq. in Engl. & Prantl., *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 176. 1895; Brandis, *Indian Trees*, imp. 1 & 2, 508 (1906), imp. 2a, 508 (1907), and imp. 3, 508. 1911; Firminger, *Man. Gard. India*, ed. 6, 2: 386--387. 1918; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 15, 75, 86--87, 109, & ix. 1921; Brandis, *Indian trees*, imp. 4, 508. 1921; Stapf, *Ind. Lond.* 2: 238. 1930; Rehne1t, *Pareys Blumengärtn.*, ed. 1, 280. 1932; B. Thomas, *Engl. Bot. Jahrb.* 68 [Gatt. *Clerod.*] 9 & 10. 1936; Kanjilal, Das, Kanjilal, & De, *Fl. Assam*, imp. 1, 3: 486, 493, & 546. 1939; Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Prelim. Alph. List Inv. Names* 21 & 40. 1940; Biswas, *Indian For. Rec. Bot.*, ser. 2, 3: 41. 1941; Calderón & Standl., *Fl. Salvad.*, ed. 2, 236. 1941; Mold., *Alph. List Inv. Names* 19 & 40. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 54, 72, & 90. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 561 (1946) and imp. 2, 2: 916. 1946; Mold., *Alph. List Cit.* 1: 105 & 277. 1946; Mold., *Alph. List Inv. Names Suppl.* 1: 6. 1947; Mold., *Alph. List Cit.* 2: 353, 358, 411, 413, 484, 489, 559, 563, 564, & 631 (1948), 3: 663, 762, 844, 849, & 936 (1949), and 4: 996, 1101, & 1110. 1949; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 124, 126, 158, & 161. 1949; Synge in Chittenden, *Roy. Hort. Soc. Dict. Gard.*, ed. 2, 1: 505. 1956; Mold., *Résumé* 159, 161, 216, 264, 268, 344, & 450. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 561 (1960) and imp. 3, 2: 916. 1960; Backer & Bakh., *Fl. Java* 2: 607--608. 1965; Rao & Rabha, *Bull. Bot. Surv. India* 8: 301. 1966; Deb, Sengupta, & Malick, *Bull. Bot. Soc. Beng.* 22: 199 & 210. 1968; Mold., *Résumé Suppl.* 16: 20. 1968; Brandis, *Indian Trees*, imp. 5, 508. 1971; Mold., *Fifth Summ.* 1: 267, 270, 272, 358, 446, 454, 462, & 622 (1971) and 2: 866. 1971; Roxb., *Fl. Indica*, ed. 2, imp. 3, 480 & 481. 1971; Mold., *Phytologia* 34: 269 & 273. 1976; Mold., *Phytol. Mem.* 2: 258, 259, 270, 349, 386, & 537. 1980; Roxb., *Hort. Beng.*, imp. 2, 46. 1980; Kanjilal, Das, Kanjilal, & De, *Fl. Assam*, imp. 2, 3: 486, 493, & 546. 1982; Mold., *Phytologia* 50: 259 (1982) and 58: 197. 1985.

Illustrations: Lindl., *Edwards Bot. Reg.* 16: pl. 1307 (in color). 1830; W. Hook., *Curtis Bot. Mag.* 62 [ser. 2a, 9]: pl. 3398 (in color). 1835; Bocq., *Adansonia*, ser. 1 [Baill., *Rec. Observ. Bot.*], 2: pl. 8, fig. 26--28. 1862; Bocq., *Rév. Verbenac.* pl. 7. 1863; Edgeworth, *Pollen*, ed. 1, pl. 2 (20) (1877) and ed. 2, pl. 2 (20). 1879; André, *Rev. Hort.* 65: pl. 60 (in color). 1893.

An erect, sometimes subarborescent shrub or small tree, 1--5 m. tall; branchlets slender, obtusely tetragonal, densely short-pubescent or hirsute with divergent hairs or eventually merely puberu-

lent, brownish; nodes not annulate, often slightly swollen; principal internodes abbreviated, 1.5--2.5 cm. long; leaves decussate-opposite or ternate, large, numerous, very variable in shape, exstipulate, often very unequally paired (anisophyllous); petioles slender or stout, 2.5--18 cm. long, densely short-pubescent or hirsute with spreading hairs, slightly canaliculate above, often collapsing at both the apex and base in drying, basally somewhat ampliate; leaf-blades membranous, very fragile and brittle when dry, uniformly dark-green on both surfaces or lighter beneath, often tinged reddish or purplish, often brunescent in drying, very variable in shape, ovate-lanceolate and sagittately or hastately lobed or oblong and hardly angular, 9--30 cm. long, 2.5--25 cm. wide, apically mostly acuminate, marginally mostly rather conspicuously ciliate and hastately or palmately and deeply 3--5-angulate-lobed with the central lobe much the largest, basally mostly deeply (sometimes only shallowly) cordate or triangular-acute into the petiole apex at the mid-point, varying from rather densely spreading-pubescent or spreading-villous on both surfaces with silky multicellular hairs to subglabrous on both surfaces, sometimes scaberulous above, often purplish beneath, the lobes ovate or ovate-oblong and apically mostly acuminate or merely acute; midrib slender or stout, flat above, prominent beneath (especially heavy basally on larger leaves); secondaries slender, 4--9 per side, arcuate-ascending, the 2 lowest basal, those entering the lobes straight and extending to their very tip, all mostly flat above and prominulent beneath; veinlet reticulation firm, rather sparse, usually not conspicuous; inflorescence terminal and axillary in the uppermost leaf-axils, forming a large, broad, terminal, cymose or corymbiform panicle to 20 cm. long and wide (or larger if during anthesis the corolla length is included); peduncles 2--4.5 cm. long, densely hirsute-pubescent like the branchlets; sympodia and inflorescence ramifications also densely hirsute-pubescent; bracts scattered in the inflorescence, foliaceous, long-stipitate, usually elliptic, 2--6 cm. long, 7--12 mm. wide, apically acuminate, hirsute-pubescent like the leaf-blades; bractlets and prophylla numerous, linear or narrowly elliptic, 1--1.5 cm. long, rapidly diminishing in size upwards, pubescent; pedicels very slender, 1--2 cm. long, more or less sparsely hirsute-pubescent with glandular-capitate multicellular hairs; flowers numerous, fragrant; flower-buds white; calyx campanulate, 1.5--2.5 cm. long, somewhat inflated, dull greenish-white suffused with red, externally glabrous or subglabrous, 5-parted to below the middle, the lobes ovate-oblong, purple, about 1 cm. long, apically acute; corolla hypocrateriform, white or cream-color, the tube slender, 10--15 cm. long, about 5 mm. wide, ampliate and inflated apically from the point of stamen insertion, straight or recurved in various angles depending on age, externally spreading-villous, the throat finely purple-dotted, the limb to 4 cm. wide during full anthesis, the lobes oblong or sub lanceolate, 1.5--3 cm. long, 4--5 mm. wide, tortuous, eventually reflexed, glabrous or subglabrous, dorsally with numerous sessile glands; stamens didynamous, inserted in the corolla tube near its mouth; filaments smooth, the enclosed portion white,

the exposed portion purple; anthers incumbent; style equaling the corolla; stigma bifid, its lobes spreading, apically acute; ovary ovate, tetragonal, 5-celled; ovules solitary in each cell; fruiting-calyx much accrescent, red or dark-red; fruit drupaceous, obovate, 1.5--1.7 cm. long and wide, shiny, deep-purple or bluish-black to purplish-black, externally glabrous, apically 4-lobed, succulent, 4-celled (or with 1--3 cells aborted); seeds solitary; endosperm absent; cotyledons obovate, fleshy; radicle inferior, roundish.

Collectors have found this very distinctive plant growing in forests, at 270--1300 m. altitude, in flower from April to June. Kanjilal and his associates (1939) assert that in Assam it fruits in the "cold season".

Lindley (1830) comments that "this is a very handsome shrub while in flower. It is a native of Silhet, where it was found by the late Mr. M. R. Smith, and by him sent to Dr. Roxburgh in 1811. The Hindustani and Bengali name is Hathi Khan, or Elephant's Ear, in allusion to the shape and size of its leaves. It produces its elegant white and fragrant flowers in the hot season, during the months of April and May, and ripens its berries in June and July. In the Botanic Garden of Calcutta it thrives luxuriantly. For the foregoing account of this plant we are indebted to the kindness of Dr. Wallich, by whom seeds were sent to Europe. Our drawing was made from a specimen obligingly communicated by the Honourable and Rev. W. Herbert, in November last. In the stove it is a rapid-growing plant, easily known by the dark green colour of its halberd-shaped leaves, which have often a deep stain of purple. It increases freely by cuttings." The fruits, of course, are drupes, not "berries".

Rao & Rabha (1966) also list the species from Assam, while Calderon & Standley (1941) record it as cultivated in El Salvador.

Wallich (1829) based his *Clerodendron sagittatum* on two collections: 1786/1 from Silhet and 1786/2 from the Calcutta Botanical Garden. Later (1831) he corrected the name to *Clerodendrum hastatum* Wall. Some authorities claim that, strictly speaking, the binomial should be written "(Roxb.) Wall.", since he gives Roxburgh's still not validly published binomial, *Siphonanthus hastata* (as "*hastatus*") as a synonym. In this second work he cites a third collection, 1786/C from Gualpara in the Hamilton herbarium.

According to Sweet (1830), the plant we now know as *Clerodendrum hastatum* was introduced into English gardens in 1824 from the "E. Indies" --this locale is obviously incorrect since Roxburgh, Wallich, and Lindley all agree that the original collection was from Silhet and from there introduced to Calcutta (whence it was later introduced into the horticultural trade. Synge (1956) gives "1825" as the original date of its introduction.

Keys to help distinguish this species from some of its allies will be found under *C. bethunianum* Low and *C. griffithianum* C. B. Clarke in the present series of notes (58: 197 and 60: 134 & 136).

The corollas of *Clerodendrum hastatum* are described as "white" by Lindley (1830) and on Sengupta 1404, as "greenish-white" by Firminiger (1918) and on Koelz 25168, "white-cream" on Koelz 29642, and "creamy-yellow" on Chand 5479.

Vernacular and common names listed for this species are "alta alda", "dieng-kym-bata-ngiang-mong", "halbert-leaved clerodendrum", "hathi khan", "hattee-kama" [=elephant's ear], "martinica", and "misteriosa".

Bakhuizen (1921) cites Roxburgh's *Flora Indica* reference to "1820" but volume 3 of the first printing of edition 2 was issued in 1832.

Citations: INDIA: Assam: *Chand* 5479 (Mi), 5480 (Mi); C. B. *Clarke* 44033D (L); *Hooker f. & Thomson s.n.* [Mont. Khasia, 2000 ped.] (K, K, K, L, Ld--photo, Ld--photo, Mu--798, N--photo, N--photo, Pd, S); *Koelz* 25168 (Mi), 29642 (Mi); *Native collector s.n.* [Khasia hills] (Mu--800, T); *Simons s.n.* [Assam] (Bz--19371, Bz--19372, L, N, Pd); *Wallich* 1786/1 (L, Pd); *G. Watt* 11684 (Na--12945). West Bengal: *Herb. Hooker s.n.* [Bengal] (K, N). BANGLADESH: *W. Griffith* 6049/1 (L, Mu--801, S). CULTIVATED: Austria: *Herb. Reichenbach f. s.n.* (V). Belgium: *Herb. Hort. Claremont s.n.* (Br); *Herb. Scheidweiler s.n.* [Inst. Gembloux] (Br). England: *Lambert s.n.* [Hort. Boyton 1831] (V, V). France: *Herb. Martius s.n.* [1842] (Br). Germany: *Herb. Hort. Bot. Monac. s.n.* [10.VI.1891] (Mu--3848), *s.n.* [20.VII.03] (Mu); *Lindblad s.n.* (Us). India: *Herb. Hort. Bot. Calcutt. s.n.* (B, Mu--799); *Wallich* 1786/b (K, V, V). Java: *Bakhuizen* 764 (Bz--19370); *Herb. Hort. Bot. Bogor.* XI.G.19 (N), XI.G.55 (Bz--25739), XI.G.58 (Bz--25741, Bz), XI.G.60 (Bz--25743), XI.G.61 (Bz--25744), XI.G.61 en a (Bz--25745, Bz--25746), XI.G.79 (Bz--25788), XI.G.102 (Bz--25800, N), XI.G.105 (Bz--25801, Bz--26535, Bz--26536, Bz, Bz, Bz), XI.G.105a (Bz--25802, Bz--26803, Bz, N), XII.B.VI.22 (Bz--26245, Bz, N), XV.J.A.XXXI.7 (Bz--26378, N), XV.J.A.XXXIII.4 (Bz--26391, N), XV.L.2 (Bz--26478, N), XV.L.3 (Bz--26479), XV.L.4 (Bz--26480, N), XV.L.7 (Bz--26481). Netherlands: *Herb. Lugd.-bat.* 908265-701 (Ld--photo, Le, N, N--photo, S--photo). Russia: *Herb. Fischer s.n.* (L); *Regel s.n.* [Herb. Bot. Petrop. 56.6] (L). Sweden: *Herb. Mus. Bot. Stockh. s.n.* (S). Switzerland: *Reuter s.n.* [Hort. Genev. 1844] (X), *s.n.* [Hort. Genev. 1871] (X). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Braun s.n.* (L). MOUNTED ILLUSTRATIONS: *Lindl.*, *Edwards Bot. Reg.* 16: pl. 1207. 1830 (Ld).

CLERODENDRUM HENDERSONII Mold., *Phytologia* 33: 372. 1976.

Bibliography: Hocking, *Excerpt Bot.* A.28: 260. 1976; Mold., *Phytologia* 33: 372 (1976) and 34: 265. 1976; Mold., *Phytol. Mem.* 2: 295 & 537. 1980; Mold., *Phytologia* 58: 460. 1985.

A shrub or small tree, to 5 m. tall; branches and branchlets rather stout, very pithy, usually rather deeply round-sulcate in drying, with longitudinal sulcations, glabrate; leaves decussate-opposite; petioles rather stout, 3.5--5 cm. long, minutely pilosulous or glabrescent; leaf-blades thinly membranous, fragile when dry, deltoid-ovate, 10--15 cm. long, 6--10 cm. wide, apically plainly acuminate, marginally entire, basally truncate, glabrous or subglabrate on both surfaces; inflorescence terminal, cymose, the cymes composed of about 5 opposite ramifications, the 2 central ones often short-stalked, each apically several-brachiate and about 10--12-flowered, the individual flowers very shortly pedicellate; pedicels somewhat dusty-pilosulous; flowering calyx campanulate, nigrescent in drying,

about 7 mm. long, externally glabrous or subglabrous, 5-lobed, the lobes lanceolate-ovate, about 2 mm. long, apically acute; corolla infundibular or hypocrateriform, white, the tube very slender, about 1.3 cm. long, nigrescent in drying, externally glabrous, the limb 5-parted, about 1 cm. wide during full anthesis, glabrous; fruit drupaceous, magenta.

This species is based on *M. R. Henderson 23299* from about 4600 feet altitude on the Cameron Highlands in Pahang, Malaya, collected on April 1, 1930, and deposited in the Britton Herbarium at the New York Botanical Garden. It is apparently closely related to and very similar in appearance to *C. colebrokianum* Walp.

Collectors have encountered *Clerodendrum hendersonii* at 4600--5500 feet altitude, growing along roadsides, in anthesis in April and May.

Citations: MALAYA: Pahang: *Collector undetermined s.n.* [4.5.;964] (K1--8117); *M. R. Henderson 23299* (N--type); *B. C. Stone 5578* (K1--6195).

CLERODENDRUM HENRYI P'ei, Mem. Sci. Soc. China 1 (3): 152, pl. 27 [as "*Clerodendron*"]. 1932; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57 & 90. 1942.

Synonymy: *Clerodendron henryi* P'ei, Mem. Sci. Soc. China 1 (3): 152. 1932.

Bibliography: P'ei, Mem. Sci. Soc. China 1 (3); 125 & 152, pl. 27. 1932; P'ei, Verbenac. China 125 & 152, pl. 27. 1932; P'ei, Sinensia 2: 76. 1932; A. W. Hill, Ind. Kew. Suppl. 9: 68. 1938; Worsdell, Ind. Lond. Suppl. 1: 238. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 64. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131 & 181. 1949; Mold., Résumé 169 & 450. 1959; Mold., Fifth Summ. 1: 287 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 277 & 537. 1980; Xioang, Act. Bot. Yunn. 3: 62. 1981; Mold., Phytologia 59: 470. 1986.

Illustrations: P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] pl. 27. 1932.

Apparently a shrub or climber; branches and branchlets tetragonal; leaves decussate-opposite; petioles 1.5--4 cm. long; leaf-blades chartaceous, elliptic-lanceolate to oblong, 10--13.5 cm. long, 3--5 cm. wide, apically acuminate, marginally entire and undulate, basally rotundate or rarely acute, glabrous on both surfaces, with a few glands; midrib prominent beneath; secondaries 7 or 8 per side, prominent beneath; inflorescence elongate, composed of racemosely arranged thyrsi, about 19 cm. long (in all) and 15 cm. wide, the primary ramifications about 4 cm. long; bracts lanceolate; calyx deeply lobed, glabrous, the tube about 2 mm. long, the lobes ovate, about 5 mm. long, apically acute; corolla hypocrateriform, externally glandular, internally glabrous, 5-lobed, the tube 1.5--1.7 cm. long, the lobes oblong, 9 mm. long and 4 mm. wide; stamens exserted, twice as long as the corolla-tube; filaments glabrous; anthers 2-celled, the thecae parallel; style glabrous; stigma bifid; ovary externally glabrous; fruit drupaceous, about 8 mm. long and wide, greenish.

[to be continued]

ANOTHER LOOK AT *ERAGROSTIS* *TEPHROSANTHOS* (GRAMINEAE)

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The genus *Eragrostis* has perplexed botanists since the time of Linnaeus, who assigned the species to *Poa*. Characteristics which serve to separate species, especially some of the annuals, are rather subtle, and accurate determinations are often difficult for anyone who has not had considerable experience with the group. Koch (1974) made a significant contribution to our understanding of the group of annuals which he studied, submerging three species which had been recognized in the second edition of Hitchcock's Manual (1951), and reducing a fourth to the status of variety. His relegation of *E. diffusa* Buckl. and *E. arida* A. S. Hitchc. to synonymy, merging the former with *E. pectinacea* (Michx.) Nees, and the latter with *E. tephrosanthos* Schult., seems reasonable. Some users of his treatment, however, may consider it still too conservative as they struggle to separate the above two species one from the other and from the closely related *E. pilosa* (L.) P. Beauv.

It is apparent from a perusal of Koch's treatment that his decision regarding whether or not to recognize *Eragrostis tephrosanthos* as distinct from *E. pectinacea* was not an easy one. While he did, indeed, treat these two taxa as distinct species, he informs us that the only difference between the two is that the pedicels of the spikelets are appressed to the branches in *E. pectinacea*, whereas they are spreading to various degrees in *E. tephrosanthos*. He adds that this character in *E. tephrosanthos* is expressed only at maturity, and even then—although infrequently—most of the pedicels on a plant may be appressed; in *E. pectinacea*, he states, the pedicels rarely diverge as much as 20°. He points out that the distributions of these two "species" are coincident over most of the southern range of *E. pectinacea*, and that their chromosome numbers, flowering times, and habitats are the same. Nevertheless, he reports that he found no evidence of hybridization between the two. One may wonder how he can be so confident of this in view of the fact that the one character separating the taxa (appressed vs spreading pedicels) is not absolute. He argues, however, that even though the morphological difference between the two taxa is a "relatively minor one," it was consistent, and he had "little difficulty in separating the two."

Although a number of recent authors have accepted Koch's conclusions without comment, McVaugh (1983) appears to express some skepticism, and suggests that to the "uninitiated" the separation may not be so easy. He cites an example of a specimen in which two recognized authorities (L. H. Harvey and S. D. Koch) did not agree as to whether it represented *E. pectinacea* or *E. tephrosanthos*!

In working with plants of this complex from the southwestern U.S.

and northern Mexico, I have found that the majority have either appressed or spreading pedicels and, therefore, one is able to name them with some confidence. A not inconsiderable number, however, can be determined only in a somewhat arbitrary manner. In view of this, it seems to me that a more satisfactory disposition of these two taxa would be to treat them as varieties of a single species; *Eragrostis pectinacea* has priority.

A search for a varietal name for the "*tephrosanthos*" taxon revealed that the epithets published by Fournier (1886) as varieties of *Eragrostis Purshii* Schrad. have priority in that rank (cf. ICBN, Sydney, 1983. Art. 11.3). The first of these is "*miserrima*," which has a short description and appears to be based on *E. parvula* Steud., which is listed as a synonym. Koch (1974) has examined a type fragment at US, and determined it to be a synonym of *E. tephrosanthos*. The epithet, *miserrima*, therefore, is here selected as the appropriate one to represent the "*tephrosanthos*" taxon when it is treated as a variety of *E. pectinacea*. The correct name for each of the two varieties discussed is given below along with the relevant synonymy. For more complete synonymy, see Koch (1974).

ERAGROSTIS PECTINACEA (Michx.) Nees, Fl. Afr. Austral. 406. 1841.
var. *pectinacea*

Poa pectinacea Michx., Fl. Bor. Amer. 1: 69. 1803.

var. *miserrima* (Fourn.) J. Reeder, comb. nov.

Eragrostis Purshii Schrad. var. *miserrima* Fourn., Mexic. Pl.
2: 116. 1886. (based on *Eragrostis parvula* Steud.)

Eragrostis parvula Steud., Syn. Pl. Glum. 1:277. 1854.

Eragrostis tephrosanthos Schult., Mantissa 2: 316. 1824.

Eragrostis arida A. S. Hitchc., Jour. Washington Acad. Sci.
23: 449. 1933.

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- Hitchcock, A. S. 1951. Manual of the Grasses of the United States. (2nd ed. revised by Agnes Chase). U.S. Dept. Agric. Misc. Publ. 200. 1051 pp.
- Koch, S. D. 1974. The *Eragrostis pectinacea-pilosa* complex in North and Central America (Gramineae: Eragrostoidae). Illinois Biological Monographs 48. 74 pp.
- McVaugh, R. 1983. Flora Novo-Galiciana. A descriptive account of the vascular plants of western Mexico. Vol. 14. Gramineae. 436 pp. Ann Arbor: Univ. Michigan Press.

BOOK REVIEWS

Alma L. Moldenke

"MEDICINAL PLANTS IN WEST TROPICAL AFRICA" by Bep Oliver-Bever, xi & 375 pp., 44 b/w fig. incl. 33 photo., & 21 tab. Cambridge University Press, Cambridge & London, U. K., & New York, N. Y. 10022. 1986. \$75.00.

Studies such as this very carefully reported, organized, documented and illustrated one are of great importance now as these land areas are being destroyed by bulldozers for timber and roads, crop planting, population expansions, desertification and other changes that obliterate the virginal vegetation with its known native uses (medicinal and otherwise). In this book are chapters on specific plant actions on the cardiovascular and nervous systems, on the hormones of the adrenal, cortex, sex and thyroid glands, on the anti-bacterial, -fungal, -viral, -protozoan and -metazoan plants and on sweetening agents. "This book is a sequel to the author's 1960 monograph 'Medicinal Plants in Nigeria'."

"THE BOOK OF TOPIARY" by Charles H. Curtis & W. Gibson, x & 82 pp., 1 b/w draw. & 35 photos. Charles E. Tuttle Company, Inc., Rutland, F. O. Box 410, Vermont 05701. 1986. \$6.50 paperbound.

This very interesting little book is a combination appreciation of, history about, directional preparations for forming and maintaining, of good U. K. sources of topiary specimens and such training skills. Both the excellently clear photographs and the informative text provide a fine survey of the topiary art accomplished mostly with tree-sized *Taxus* and shrub-sized *Buxus*.

"LOS PARAMOS ANDINOS DEL ECUADOR" by Misael Acosta-Solis, 222 pp., 30 b/w fig., 5 maps & 5 tab. Publicaciones Cientificas Mas, Apartado 408, Quito, Ecuador. 1984. Paperbound.

The author, our admired friend, has been president of the Ecuadorian Institute of Natural Sciences and lifetime student and collector high in the Andean paramos. These areas are unique, from 3,000 to 6,300 m. high with only lichens and snow above the 4,800 m. level and a carefully studied specialized flora below. There are several fine drawings of different paramos indicating their overall appearances geographically and botanically. The carefully written text supplies the rest. His personal dedication and enthusiasm spill over into his listings of all the wonderful further studies needing to be undertaken. The Spanish is direct and easily readable.

Some friends should have helped the author with his English summary and German Zusammenfassung.. This study should have worldwide appeal to botanists of many orientations, ecologists, conservationists and geographers.

"HORMONES, RECEPTORS AND CELLULAR INTERACTIONS IN PLANTS" edited by C. M. Chadwick & D. R. Garrod, xii & 375 pp., 55 multi-fig., 55 electronmicrographs & 20 tab. Cambridge University Press, Cambridge, London & New York, N. Y. 10022. 1986. \$69.50.

This is the first book published in the new series entitled "Inter-cellular and Intracellular Communication". The 24 authors of the 12 chapters are mainly from the British Commonwealth, but 4 each are from the U.S.A. and the Netherlands. All are advanced laboratory scientists dealing with ligand-receptor interactions of binds that are chemically specific and exclusive as have been studied more freely in animal cells not encumbered with cellulose cell-walls beyond their plasma membranes. Auxin, gibberellin and ethylene receptors, yeast cell recognition and adhesion in mating, pollen-stigma reactions in *Brassica oleracea* and *Rhizobium*, legume root-hair attachments, are some of the important topics treated. Cytologists, biochemists, physiologists at the advanced student and laboratory research levels can certainly benefit from these papers. University libraries and scientific laboratories should have this book even if it does seem over-priced.

"THE RHIZOSPHERE" by Elroy A. Curl & Bryan Truelove, x & 288 pp., 57 b/w fig. incl. 39 photo., & 20 tab. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1985. \$83.00.

This is the 15th presentation in the Advanced Series in Agricultural Sciences. It is amazing how much carefully reported and explained subject matter is dealt with in this relatively small book. The language is concise, clear and logical, making this book an ideal source in appropriate college and university courses in ecology, nematology, bacteriology, mycology, parasitology, zoology, botany and agriculture. These intimate associations of soil organisms attracted by the exudates of root tips and root hairs are of various natures and effects. "The most common symbiotic alliances between plant roots and microorganisms involve *Rhizobium* in the nodulation of legume roots, and various fungi which form either ectomycorrhizae or vesicular-arbuscular endomycorrhizae in many plants." Although the declared role of phytoalexins, ethylene, etc. in resistance is based largely on in vitro studies, "efforts to manipulate the rhizosphere for disease control are at the forefront of research activity". The sale price of this book will probably be a barrier to many students and low budgeted libraries.

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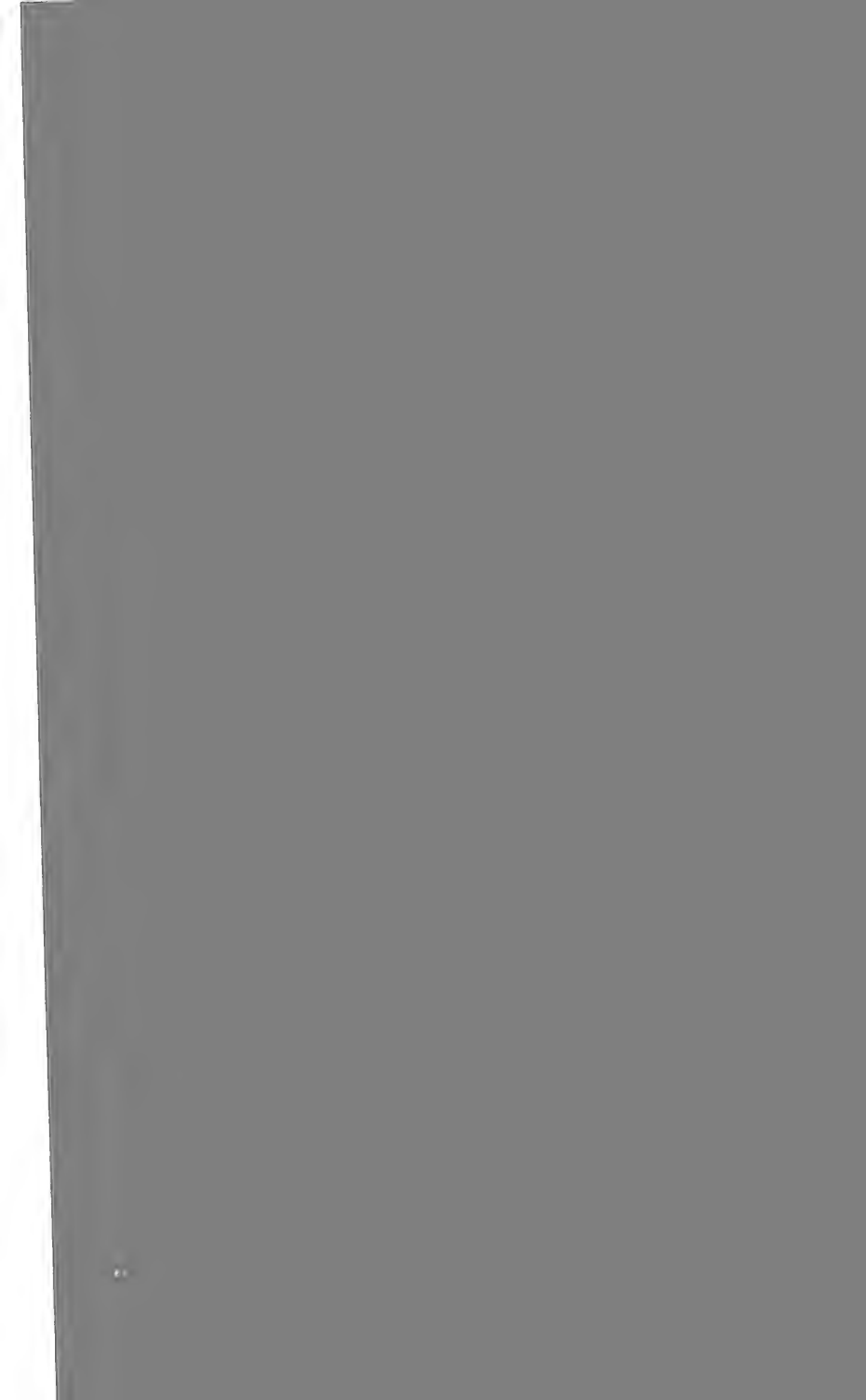
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A NEW SPECIES OF SENECIO (ASTERACEAE) FROM TAMAULIPAS, MEXICO

B. L. Turner

Department of Botany, University of Texas, Austin, TX 78713

Routine identification of Mexican Asteraceae has revealed the following novelty.

SENECIO RICHARDSONII B. L. Turner, sp. nov. Fig. 1.

Senecio huachucanus accedens sed sparsifoliis, longipedunculatis, petiolis subauriculatis.

Perennial herb to 1.5 m high. Stems glabrate, striate to somewhat angulate. Leaves elliptic-lanceolate to somewhat oblanceolate, denticulate; lower leaves 10-20 cm long, 1-4 cm wide, at first white tomentulose but soon glabrate; stem leaves abruptly or gradually reduced upwards, auriculate clasping. Heads (2)5-20 in terminal, open corymbose cymes. Involucres campanulate, glabrous, 6-7 mm high, 5-6 mm wide; bracts 13-21, the apices acute, tufted; calyculum of 1-3 slender bracts 1-3 mm long. Ray florets ca. 8 or ca. 13; ligules yellow, 6-8 mm long, 2-3 mm wide. Disk florets numerous (40-90); corollas yellow, glabrous, 6-7 mm long. Achenes columnar, glabrous, 2-3 mm long; pappus of numerous white, fragile, nearly eciliate bristles 6-7 mm long.

TYPE: MEXICO: TAMAULIPAS: Gomez Farias Area, Rancho del Cielo, "above Ollo de Nubes", 22 Jul 1968, Alfred Richardson 778 (holotype, TEX).

Additional Collections Examined: MEXICO. NUEVO LEON: ca. Cola de Caballo (100° 10' X 25° 23'), "Bosque, 20 Jun 1984, Villarreal et al. 2788 (TEX); Chipinque Park, SW of Monterrey along road above hotel, pine-oak forest, 11 Jun 1978, Poole & Watson 1346 (TEX). TAMAULIPAS: northern limits of Charco dos Perros on rocky winding road from Julilo. Cloud forest. 9 Jun 1967, Stuessy 843 (TEX).

In addition to S. huachucanus the species might also be compared to Senecio madrensis Wats. but that species is rayless, has much larger, more tomentose, leaves and thicker congested peduncles. The type differs from the remaining specimens cited in having longer, thinner, mostly basal leaves, and somewhat larger heads borne in nearly naked scapes up to 70 cm long. Nevertheless, details of the heads are quite similar and I have no doubt that all of the plants cited are closely related, although additional field observations and collection might reveal two recognizable taxa.

It is a pleasure to name the species for my former student, Dr. Alfred Richardson of Southmost College, Brownsville, Texas, who has collected widely in the Gomez Farias region.



Fig 1 *SENECIO RICHARDSONII*, from holotype.

DISTRIBUTIONAL ADDITIONS FOR SOME ILLINOIS VASCULAR PLANTS

R. D. Henry and A. R. Scott

R. M. Myers Herbarium and Institute for Environmental Management
Western Illinois University, Macomb 61455

ABSTRACT

Two hundred fifty-eight Illinois vascular plant species county distribution additions are reported. Additionally are also included some collections of fifteen varieties, seventeen forms and thirteen non-nomenclatural variants.

INTRODUCTION

As part of a continuing effort to update the spontaneous Illinois vascular plant flora, we report 258 county species distribution additions as determined mainly from Mohlenbrock and Ladd (1978), Mohlenbrock (1985) and Ladd and Mohlenbrock (1983). Nomenclature mainly follows Mohlenbrock (1975) and the taxa are listed alphabetically. Each plant is annotated with the county collected in, the collection number(s) of Henry and Scott or if another collector their name and collection number and in a few cases a brief remark concerning the plant. Voucher specimens are deposited in the R. M. Myers Herbarium of Western Illinois University (MWI).

Also, in addition, are included in this report collections of 15 varieties, 17 forms and 13 non-nomenclatural variants of which eight are flower color, one flower morphology, one vivipary, one leaf morphology and two gigantism.

We would like to gratefully acknowledge the Western Illinois University Institute for Environmental Management, the W.I.U. Research Council, the Central Illinois Light Company and the Illinois Department of Transportation for financial support during the course of this project.

LIST OF SPECIES

Abutilon theophrasti
Brown (1250)
Schuyler (1259)

Ailanthus altissima
Mason (1278)
Schuyler (1258)

Acer nigrum
Pike (5071, 5397)

Alliaria officinalis
Fulton (4556, 4557, 4558,
4559)

Allium sativum
Pike (5225, 5348, 5349)

Alnus glutinosa
Hancock (4772, 4773, 4774,
4775)
Henderson (4795, 4796)

Both county collections were made from spontaneous plants growing at the edge of the Mississippi River in 1982. The Hancock County tree was about 25 feet tall and 22 inches in diameter; the Henderson County tree was several feet tall.

Alopecurus pratensis
McDonough (4113)

Althaea rosea
Pike (5120)
Warren (1293)

Amaranthus graecizans
Brown (1237)
Warren (1126)

Amaranthus hybridus
Warren (1141)

Ambrosia bidentata
Brown (1224)

Amphicarpa bracteata var.
comosa
Warren (1143)

Andropogon virginicus
Knox (4867)
McDonough (4184)

Arenaria serpyllifolia
Henderson (4821)

Asclepias tuberosa var.
interior
Brown (1232)
Fulton (Kuzniar s.n.)

Asparagus officinalis
Brown (1251)

Asplenium rhizophyllum
Fulton (Kuzniar BM-1)

Aster cordifolius
Warren (1120, 1121)

Aster lateriflorus
Warren (1203, 1204)

Aster praealtus
Pike (4958, 5387, 5465)

Aster puniceus var. lucidulus
Pike (4957)

Aster shortii
Warren (1117)

Astragalus canadensis
Pike (5094)

Bacopa rotundifolia
Adams (4697, 4698, 4699,
4700)

Baptisia leucantha
Pike (5216)

Barbarea vulgaris var. arcuata
Warren (1123)

Bidens connata
Fulton (4627)

Bidens frondosa
Warren (1154)

Bidens vulgata
Pike (5502)

Brassica kaber var.
schkuhriana
Fulton (4572)

Brassica nigra
Brown (1235)

Brickellia eupatorioides
Schuyler (1256)

Bromus japonicus
Pike (5043)

Bromus racemosus
Pike (5041, 5042)

Cacalia atriplicifolia
Warren (1179)

Cacalia tuberosa
Pike (5170)

Calystegia sepium var.
americana
Brown (1252)

Campsis radicans
Warren (1173)

Cardamine douglassii
Pike (5289)

Cardamine hirsuta
Fulton (4560, 4561, 4562)

Carex albursina
Pike (5240)

Carex bushii
Pike (5277)

Carex conoidea
Pike (5233, 5236)

Carex crus-corvi
McDonough (4259)

Carex gracilescens
Pike (5269)
Warren (1118, 1119)

Carex jamesii
Pike (5235, 5423)

Carex lanuginosa
Pike (5232)

Carex lupuliformis
Warren (1186)

Carex lupulina
Pike (5110, 5278, 5425,
5426)

Carex muskingumensis
McDonough (4260)

Carex sparganioides
Pike (5272)

Carex squarrosa
Pike (5279)

Ceratophyllum demersum
Pike (5176, 5177, 5200)

Chenopodium dessicatum var.
leptophylloides
Fulton (1284)

Chloris verticillata
Pike (4924, 4925, 4926)

Chrysanthemum leucanthemum
Pike (5168)

Cinna arundinacea
Warren (1187)

Citrullus vulgaris
McDonough (4106)

Clematis dioscoreifolia
McDonough (4134, 4135)

Clematis virginiana
Warren (1176)

Commelina communis
Brown (1229)

Coreopsis tripteris
Warren (1157)

Coronilla varia
Pike (5148, 5149)

Corydalis micrantha
Adams (4742, 4743)
McDonough (4530)

Crataegus crus-galli
Pike (5337)

Crataegus pruinosa
Pike (5129)

Crepis tectorum
Hancock (1288, 1289, 1290)

Cucurbita foetidissima
Henderson (4819, 4820)

Cucurbita moschata
Pike (5434, 5486, 5487)

This plant was growing
spontaneously by a roadside in
1985.

Cucurbita pepo
McDonough (4096, 4097)
Pike (5488)
Schuyler (4899, 4900)

These plants were growing
spontaneously by a roadside
(Pike and Schuyler in 1985)
and in a cattle pasture
(McDonough in 1983).

Cuscuta campestris
Pike (4943)

Cuscuta cuspidata
Schuyler (4868, 4869)

Cuscuta polygonorum
Pike (4944)

Cynanchum laeve
Warren (1167)

Cynoglossum officinale
McDonough (4210)

Delphinium ajacis
McDonough (4328)

Desmanthus illinoensis
Warren (4938, 4939, 4940)

Desmodium dillenii
Fulton (4610, 4611, 4612)

Dicentra canadensis
McDonough (4197, 4198)

Dipsacus laciniatus
Henderson (4799, 4800,
4801)

Dipsacus sylvestris
Adams (4676)
McDonough (4085, 4086,
4212, 4213)

Draba verna var. boerhaavii
McDonough (4114)

Dyssodia papposa
McDonough (4132)

Eleocharis acicularis
Pike (5254, 5578)

Eleocharis obtusa
Pike (5253, 5255, 5256)

Eleocharis obtusa var. detonsa
Fulton (4591)

Eleocharis palustris
Pike (5257, 5258)

Elodea nuttallii
Adams (4729, 4730)

Equisetum laevigatum
Warren (1114)

Eragrostis poaeoides
Brown (1236)

Erechtites hieracifolia
Warren (1191)

Erysimum repandum
Warren (1113)

Erythronium americanum
McDonough (4194, 4195)

Helianthus strumosus
Warren (1170, 1171)

Euonymus alatus
McDonough (Gessner s.n.)

Hesperis matronalis
Pike (5159)

Plant found growing spontaneously
(perhaps from bird-carried seed)
in a ravine in 1984. This plant
was transplanted to a residence
from where this specimen was
collected.

Hieracium aurantiacum
Winnebago (Akerman 37)

Holosteum umbellatum
Warren (1111)

Euonymus atropurpureus
Warren (1183)

Humulus japonicus
Pike (5183)

Euonymus fortunei
Pike (5175)

Hypericum spathulatum
Pike (5064, 5150, 5204)

Euphorbia cyparissias
Pike (5389)

Ipomoea hederacea
Warren (1161, 1162)

Euphorbia obtusata
McDonough (4458, 4459)

Ipomoea purpurea
Pike (5446)
Warren (1163, 1164)

Fagopyrum esculentum
McDonough (1268)

Iris germanica
Pike (5410)

Gaura biennis
Henderson (4860)

Iva xanthifolia
McDonough (4346)

Gentiana puberulenta
Adams (4660, 4661)

Juncus torreyi
Pike (5358, 5421, 5477)

Glechoma hederacea
Adams (C. Strodes'
daughter s.n.)
Brown (1209)

Lamium amplexicaule
Brown (1210)
Warren (1116)

Glycine max
Warren (1134)

Lamium purpureum
Adams (4738)
Brown (1211, 1212)
Schuyler (1253)

Helianthus annuus
Brown (1228)
Warren (1160)

Lathyrus latifolius
Pike (5198)

Helianthus hirsutus
Pike (5093, 5390, 5428)

Lemna minor
Brown (1226)

Leptochloa acuminata
Pike (4989, 4991)

Lespedeza cuneata
Pike (5429, 5432, 5433,
5493)

Lespedeza intermedia
Pike (5431)

Lespedeza stipulacea
Fulton (4595)

Lesquerella gracilis
Pike (5161)

Mohlenbrock (1980) p. 203 states this alien plant is known only from two 1894 collections along a railroad in Cook County. This 1985 collection was from a roadside.

Lindera benzoin
Brown (1217)

Linum usitatissimum
McDonough (1269)

Liquidambar styraciflua
Hancock (Witter s.n., Henry
& Scott 4781)

Tree about 18 feet tall that appears planted in a lawn about 50 feet from the Mississippi River but owner says not planted and that he mowed around it as a young tree when the area was weeds to later have a tree in the lawn. Specimen collections were made in 1982.

Lithospermum arvense
Brown (1215)
Warren (1112)

Lolium multiflorum
Pike (5040)

Lolium perenne
Pike (5039)

Lonicera japonica
Pike (5492)

Lonicera maackii
McDonough (1264)

Lonicera morrowi
McDonough (4204)

Lonicera tatarica
Brown (1240)

Lycopersicum esculentum
Peoria (4864)
Pike (5215, 5501)

Lycopus uniflorus
Pike (5362)

Lythrum salicaria
McDonough (4333)

Malus pumila
Pike (5054, 5333)

Malva rotundifolia
Warren (1174)

Mimulus ringens
Warren (1158, 1159)

Miscanthus sacchariflorus
McDonough (4108, 4109,
4110)

Mollugo verticillatus
Warren (1199, 1200)

Muhlenbergia racemosa
Warren (1110)

Myosurus minimus
Brown (1213)

Myriophyllum heterophyllum
Pike (4919, 4920)

- Najas gracillima
Adams (Thurrow s.n.)
- Najas guadalupensis
Pike (5346, 5347)
- Najas minor
Adams (4674, 4675)
Brown (1225)
Fulton (4583)
- Narcissus pseudo-narcissus
Brown (1208)
- Onosmodium occidentale
Pike (5305, 5306)
- Panax quinquefolius
Warren (Perry & Johnson s.n.)
- Panicum gattingeri
Pike (5612)
- Papaver somniferum
McDonough (1270)
- Paronychia canadensis
Pike (5302)
- Paspalum laeve
Adams (4708)
Pike (5554, 5555, 5556)
- Paspalum pubiflorum var.
glabrum
Pike (5552, 5553)
- Phalaris canariensis
McDonough (1261, 1262, 1263)
- Phlox paniculata
Warren (1177)
- Physocarpus opulifolius
Pike (5130, 5191, 5192, 5193)
- Pinus resinosa
McDonough (4185, 4189)
- Spontaneous seedling plants collected in 1983 in an oak-hickory forest at Argyle Lake State Park. Source of seed for these was presumably from now mature trees planted in 1948 and 1949.
- Pinus strobus
McDonough (4186, 4187, 4188)
- Spontaneous seedling plants collected in 1983 in an oak-hickory forest at Argyle Lake State Park. Source of seed for these was presumably from now mature trees planted in 1948 and 1949.
- Pinus sylvestris
Fulton (4553)
- Spontaneous young plant collected in 1984 in a remote area of an old strip mine area now vegetated with a Populus deltoides-Acer negundo forest.
- Plantago pusilla
Pike (5345)
- Poa annua
Brown (1216)
- Poa chapmaniana
Fulton (4607, 4608)
- Polanisia dodecandra
Warren (1188)
- Polygonum convolvulus
Brown (1248)
- Polygonum cuspidatum
Pike (5127, 5128, 5194, 5195)

- Polygonum erectum
Schuyler (1257)
- Polygonum hydropiper
Pike (5089, 5224)
- Polygonum persicaria
Brown (1238)
- Polygonum ramosissimum
Adams (4720, 4721)
- Polygonum sagittatum
Warren (1195, 1196)
- Polygonum virginianum
Warren (1150)
- Populus alba
McDonough (1271, 1272)
- Populus grandidentata
Mason (1279)
- Portulaca grandiflora
McDonough (4105)
- Potamogeton crispus
McDonough (4218, 4219, 4220, 4473, 4474)
- Potamogeton illinoensis
McDonough (4145, 4248, 4249, 4250, 4251)
- Potamogeton nodosus
Pike (5391)
Warren (1190)
- Potentilla recta
Brown (1247)
- Prunus mexicana
Henderson (4825)
- Ptelea trifoliata
Warren (1144)
- Pueraria lobata
Fulton (Howe s.n.)
- Spontaneous away from a road-side by which it presumably was originally planted; specimen collected in 1985.
- Quercus bicolor
Pike (5392, 5412, 5447)
- Quercus imbricaria
Warren (1201)
- Quercus muhlenbergii
Warren (1147)
- Ranunculus fascicularis
Pike (5330, 5331)
- Ratibida pinnata
Schuyler (1254)
- Ribes odoratum
McDonough (4190, 4191)
- Rorippa sylvestris
Warren (1124, 1125)
- Rubus argutus
Brown (1246)
- Rudbeckia laciniata
Warren (1151, 1152)
- Ruellia strepens
Warren (1148, 1149)
- Sagittaria calycina
Pike (5211, 5212)
Warren (1153)
- Salsola kali var. tenuifolia
Warren (1127)
- Scirpus validus
Adams (4724, 4725)
- Scleria triglomerata
McDonough (4311, 4312, 4313)

Sedum purpureum
Pike (4917, 4918)

Sedum ternatum
Pike (Thurow s.n.)

Silene antirrhina
Brown (1234)

Silphium laciniatum
Warren (1138, 1139, 1140)

Sisymbrium loeselii
Pike (5292, 5293)

Solanum dulcamara
Warren (1130, 1131)

Solidago rigida
Schuyler (4891)

Sonchus arvensis var.
glabrescens
McDonough (Reese s.n.)
Warren (1294, 1295, 1296,
1297)

Sorghum halepense
Brown (1218, 1219, 1220)

Spiranthes cernua
Pike (4945)

Taxodium distichum
McDonough (4318, 4319,
4320)

Spontaneous seedling and sapling
plants collected in 1984 on a
floodplain near where the now
mature trees were planted in
1949.

Thalictrum revolutum
Warren (1122)

Thaspium barbinode
Pike (5117, 5313)

Tragopogon dubius
Warren (1132, 1133)

Tragopogon pratensis
Brown (1233)

Tribulus terrestris
Brown (1239)

Trifolium campestre
Fulton (4584)
McLean (1280)

Triticum aestivum
Fulton (4588)
Warren (1115)

Ulmus pumila
Pike (5118)

Verbena bracteata
Warren (1136, 1137)

Verbena canadensis
McDonough (4207, 4208)

Vernonia missurica
Warren (1169)

Viola sagittata
Pike (5311)

Viola striata
McDonough (4373, 4374,
4375, 4376)

Viola triloba
Pike (5312)

Wolffia columbiana
Pike (5143)
Warren (1197)

Yucca filamentosa var. smalliana
Pike (5142)
Warren (1189)

Zannichellia palustris
McDonough (5616, 5617, 5618,
5619, 5620)

Zea mays
Warren (1181)

LIST OF VARIETIES

- | | |
|---|--|
| <u>Amorpha fruticosa</u> var. <u>angustifolia</u>
Pike (1618, 1619) | <u>Lindernia dubia</u> var. <u>riparia</u>
Adams (4707)
Henderson (4810) |
| <u>Bidens aristosa</u> var. <u>retrorsa</u>
Schuyler (1253) | <u>Ludwigia alternifolia</u> var. <u>pubescens</u>
Henderson (4842) |
| <u>Brassica kaber</u> var. <u>schkuhriana</u>
Cass (2732) | <u>Polygala verticillata</u> var. <u>isocycla</u>
Adams (4669) |
| <u>Calystegia sepium</u> var. <u>repens</u>
Warren (4933) | <u>Rorippa islandica</u> var. <u>islandica</u>
Fulton (4577)
Henderson (1575, 1576, 4793, 4794)
McDonough (Coon, Martin & Guilinger 15) |
| <u>Carex muhlenbergii</u> var. <u>enervis</u>
McDonough (4462) | <u>Teucrium canadense</u> var. <u>occidentale</u>
Cass (4908)
Fulton (4589, 4590) |
| <u>Desmodium cuspidatum</u> var. <u>longifolium</u>
Warren (1184, 1185) | <u>Vitis aestivalis</u> var. <u>argentifolia</u>
Schuyler (4893, 4894) |
| <u>Eleocharis obtusa</u> var. <u>detonsa</u>
Adams (4686, 4687)
Pike (5400, 5576, 5577) | <u>Xanthium strumarium</u> var. <u>canadensis</u>
Fulton (4602, 4622, 4623) |
| <u>Geum laciniatum</u> var. <u>trichocarpum</u>
McDonough (4434) | |

LIST OF FORMS

- | | |
|---|---|
| <u>Achillea millefolium</u> f. <u>rosea</u>
McDonough (4538, 4539, 4540) | <u>Cirsium discolor</u> f. <u>albiflorum</u>
McDonough (4133)
Warren (1180) |
| <u>Aster novae-angliae</u> f. <u>rosarius</u>
Fulton (4636) | <u>Daucus carota</u> f. <u>epurpuratus</u>
Pike (5115) |
| <u>Cichorium intybus</u> f. <u>roseum</u>
Pike (5388) | <u>Gentiana andrewsii</u> f. <u>albiflora</u>
McDonough (4496) |

Medicago sativa f. alba
Fulton (4570)

Monarda fistulosa f. albescens
McDonough (1276, 1277)
Scott (1291)

Muhlenbergia frondosa f.
commutata
Pike (5536)

Oxalis violacea var. violacea
f. albida
Pike (5124)

Phalaris arundinacea f. picta
Hancock (4783)
Pike (5559, 5560, 5561)

Phlox paniculata f. alba
Warren (1178)

Trifolium pratense f.
leucochraceum
Pike (5081)
Warren (1128)

Trillium recurvatum f. luteum
Pike (5351)

Trillium recurvatum f. shayii
McDonough (4199, 4200)
Pike (5350)

Verbena stricta f. roseiflora
McDonough (1275)

Viola pedata f. alba
Fulton (Kuzniar s.n.)

LIST OF NON-NOMENCLATURAL VARIANTS

Flower Color

Blephilia hirsuta
white flowers
McDonough (4299)

Eupatorium serotinum
rose-purple flowers
Adams (4662)

Gerardia skinneriana
white flowers
McDonough (4139)

Medicago sativa
yellow flowers
Fulton (4569)

Medicago sativa
blue-purple flowers
Fulton (4568)

Mimulus alatus
pale pink flowers
Pike (5205)

Rudbeckia hirta
rays yellow orange
Pike (5209)

Rudbeckia hirta
rays lemon yellow
Pike (5208)

Flower Morphology

Helianthus grosseserratus--has only ray flowers and no disc flowers
McDonough (4314)

Vivipary

Tradescantia ohiensis--viviparous

Adams (4665)

Pike (4916)

Leaf Morphology

Ambrosia trifida--leaves deeply divided into narrow segments

Pike (5374, 5375, 5376)

Gigantism

Asclepias verticillata--possible tetraploid.

Pike (5068)

This plant (and one other about 18 feet away) was notably more robust, about twice as tall (36 inches), greener in color and with parts about twice the size as the other plants around it. No fruits were present.

Rudbeckia hirta--possible 2X mutant

Peoria (4862)

The only plant among many around it that drew attention due to its rays and discs being twice the normal size. The lower 1/3 of the rays were a normal yellow color and the tip 2/3 were a dark pumpkin-orange color.

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A NEW SECTION AND SUBSPECIES OF CALANDRINIA (PORTULACACEAE)

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ABSTRACT. Calandrinia sect. Pachypodae, sect. nov., is proposed to distinguish two species (C. galapagosa and C. pachypoda) that possess unique pollen, seed, and capsule morphology. Calandrinia pachypoda is subdivided into subspecies pachypoda and subsp. eyerdamii (subsp. nov.) based on differences in flower, seed, and androecium morphology.

Calandrinia H.B.K. contains about 130 species. The genus is distributed in two areas of the world; the western Americas and Australia. The majority are found in western South America (especially Chile), with only four species occurring in western North America and 30 species in Australia.

There have been two major taxonomic treatments of Calandrinia. Reiche (1897, 1898) assigned the species of Chile to two subgenera and twelve sections. Von Poellnitz (1934) assigned the Australian species to eight sections. A biosystematic study of the Australian species is now in progress (Carolyn and West, personal communication). Kelley (1973) evaluated the sectional composition of Calandrinia in its entirety using morphological (especially seed and trichome) characters and palynological evidence. All American species except two were assigned to the sections created by Reiche (1897). Calandrinia galapagosa St. John and C. pachypoda Diels were distinct among the American species in pollen, seed, and capsule morphology (table 1).

All American species except Calandrinia galapagosa and C. pachypoda have either 3-zonocolpate or 12(15)-pantoporate pollen (Kelley 1973). The two unique species are 25(30)-pantoporate (fig. 1). Many authors treat pollen with more than six apertures as poly-pantoporate (e.g. Moore and Webb 1978; Reitsma 1970). This practice often combines different pollen types, and this is clearly the case in Calandrinia, where there is a sharp distinction between 12(15)- and 25(30)-pantoporate types (Kelley 1973).

Capsule morphology in these two species is also distinct in being subglobose, lustrous-yellow, and cartilaginous. In both Calandrinia galapagosa and C. pachypoda the seeds are dark brown, shining, and finely reticulate. Seed surface morphology is also atypical for the genus (Kelley 1973) in having a fine reticulate-areolate pattern on the surface. In specimens of C. galapagosa and C. pachypoda from Bolivia seeds have this pattern on a smooth surface. Calandrinia pachypoda specimens from Peru

have seeds with papillae on the entire surface or restricted to the margin. Seed morphology has been shown to be especially useful for species recognition in this genus (Reiche 1897; Kelley 1973). Figures 2-4 show seed morphology of these species.

Morphological, palynological, and habitat characters of these two species are summarized in table 1. Recognition of a new section of Calandrinia is supported by a distinct combination of pollen, seed, and capsule characters. Additionally, C. pachypoda is divided into two subspecies based on morphological (i.e. seed morphology, stamen number, petal color), geographical, and ecological distinctions.

TAXONOMIC TREATMENT

The taxa listed in table 1 may be distinguished by the following key.

a. Stamens 12-15; plants endemic to Galapagos Islands

2. C. galapagosa

a. Stamens 30-100; plants of South America

b. Petals white; stamens 30-60; seeds papillate

1a. C. pachypoda subsp. pachypoda

b. Petals purple; stamens 80-100; seeds not papillate

1b. C. pachypoda subsp. eyerdamii

Calandrinia section Pachypodae W. A. Kelley and J. R. Swanson, sect. nov. Type: C. pachypoda Diels, Bot. Jahrb. Syst. 37:399, 1906. Photograph of holotype: US!, F!; isotype: GH!.

Herbae perennes succulentae; folia linearia vel oblanceolata; inflorescentia cymosa; pollinis granula 25(30)-pantoporata, aperturis granulatis; capsula trivalvata, subglobosa, nitida-luteola, cartilaginea; semina atrobrunnea, nitida, testa subtiliter reticulata-areolata, laevi vel papillosa.

Fleshy, perennial herbs; leaves alternate herbaceous or succulent, linear or oblanceolate; inflorescence a cyme; sepals 2; petals 5, white or deep purple; stamens numerous (12-15 or 30-100); pollen 25(30)-pantoporate with scattered granulation within the aperture, 70-75 μ m diameter; fruit a many-seeded subglobose capsule, lustrous-yellow, trivalvate, cartilaginous; seeds dark brown, shining, reticulate-areolate, with or without secondary papillae.

This section contains two species, C. galapagosa St. John and C. pachypoda Diels. The distribution of the species assigned to this section is shown in figure 5.

1. Calandrinia pachypoda Diels, Bot. Jahrb. Syst. 37:399, 1906. ---
TYPE: Peru, Pacasmayo a Chepen, Feb 1905, Weberbauer 4816
(photograph of holotype: F!, US!; isotype: GH!).

Woody spreading perennial; stems succulent when young, leafy most of the year, 7-15 mm in diameter; leaves 7-8 cm long, obovate, herbaceous or succulent; inflorescence 3-4 flowered; sepals subovate, acuminate, 5 mm long, 3 mm wide; petals white or purple, 10 mm long; stamens 30-100.

- 1a. Calandrinia pachypoda Diels subsp. pachypoda

Spreading perennial herbs, becoming woody at base with age; leaves herbaceous, oblanceolate or obovate; petals white; stamens 30-60; seeds brown, with papillae on margins or over entire surface. Western Peru on rocky slopes near the coast at 800-900 m (fig. 5).

Representative specimens. PERU. Jusnin, 1904-1914, Weberbauer 5280 (F); Chosica, March 11-13, 1923, MacBride 2875 (US).

- 1b. Calandrinia pachypoda Diels subsp. eyerdamii W. A. Kelley and J. R. Swanson, subsp. nov. Type: Bolivia, Dept. Cochabamb, Mar 17, 1939, W. J. Eyerdam 24876 (holotype: UC!; isotype: F!, K!).

Herbae perennes succulentae; folia oblanceolata vel obovata; petala atropurpurea; stamina 80-100; semina laevia, brunnea, striata, reticulata-areolata.

Fleshy perennial herbs, becoming woody at base with age, leaves herbaceous or succulent, oblanceolate or obovate; petals deep purple; stamens 80-100; seeds brown, striate with finely elongate reticulations, papillae lacking. Central Bolivia at 2700 m associated with cacti (fig. 5).

This subspecies is distinguished from subsp. pachypoda by its deep purple flowers, very numerous (80-100) stamens, and smooth seeds. It is named in honor of Walter J. Eyerdam for his extensive field studies in South America (Goodspeed 1961).

2. Calandrinia galapagosa St. John, Amer. J. Bot. 24:95, 1937. ---
TYPE: Galapagos Islands, Chatham Island, Feb 8, 1906, Alban Stewart 1151 (holotype: BISH!; isotypes: CAS!, US!).

Perennial herb, very succulent, about 2 dm height; leaves alternate, succulent, linear, 3-6 mm long; cymes 25-35 mm

long, several-flowered; peduncle 8-16 mm long, fleshy; bracts ovate; pedicels 6-14 mm long; sepals 4 mm long, entire, obovate; petals obovate, 9-11 mm long, white to pink; stamens 12-15; style 4-6 mm long; stigma 3-lobed; capsule 4-5 mm in diameter, globose, yellow, cartilaginous; seeds 1-1.5 mm in diameter, smooth, but finely elongate-reticulate. Chatham Island, low bushes on lava near shore, Sappho Cove (fig. 5).

DISCUSSION

Calandrinia sect. Pachypodae appears to be a natural assemblage of closely related species as shown by similarity in pollen, seed, and capsule morphology. On the basis of floral and vegetative morphology as well as pollen wall ultrastructure (unpublished TEM studies) these species definitely belong in Calandrinia.

St. John (1937) suggested a possible relationship of Calandrinia galapagosa to members of sect. Dianthoideae Reiche. However, species assigned to sect. Dianthoideae have 3-zonocolpate pollen 34-40 μ m in diameter (Kelley 1973). The 25(30)-pantoporate pollen of C. galapagosa and C. pachypoda is 70-75 μ m in diameter. Species of sect. Pachypodae appear more closely related to members of the sect. Acaules Reiche, which have 12(15)-pantoporate pollen 70 μ m in diameter (e.g., C. acaulis H.B.K.).

We are aware that this taxonomic treatment is based on few specimens. Calandrinia galapagosa is known only from the type locality and a survey of North American herbaria showed no accessions of C. pachypoda not previously cited by Kelley (1973). The inability to receive loans from South American herbaria precluded examination of additional specimens. Recognition of sect. Pachypodae and elucidation of the bimodal nature of C. pachypoda will bring to the attention of our South American colleagues a species complex in need of additional collection and study. With so little known currently about the distribution and biosystematics of C. pachypoda subsp. eyerdamii, the authors believe its uniqueness should be recognized at the subspecific level at this time. Additional collections and evaluation of this taxon may eventually support treating it at the species level.

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Table 1. Comparison of Calandrinia sect. Pachypodae species

Characters	<u>C. galapagosa</u>	<u>C. pachypoda</u> subsp. <u>pachypoda</u>	<u>C. pachypoda</u> subsp. <u>eyerdamii</u>
Petal Color	pink-white	white	deep purple
Stamen#/flower	12-15	30-60	80-100
Pollen	25(30)- pantoporate 70 μ m dia.	25(30)- pantoporate 75 μ m dia.	25(30)- pantoporate 75 μ m dia.
Seeds	brown, primarily reticulate- areolate, and smooth	brown, primarily reticulate- areolate, and papillate	brown, primarily reticulate- areolate, and smooth
Habitat	lava fissure sea-level	stony coastal slopes 800-900m	cactus hillside, 2700m

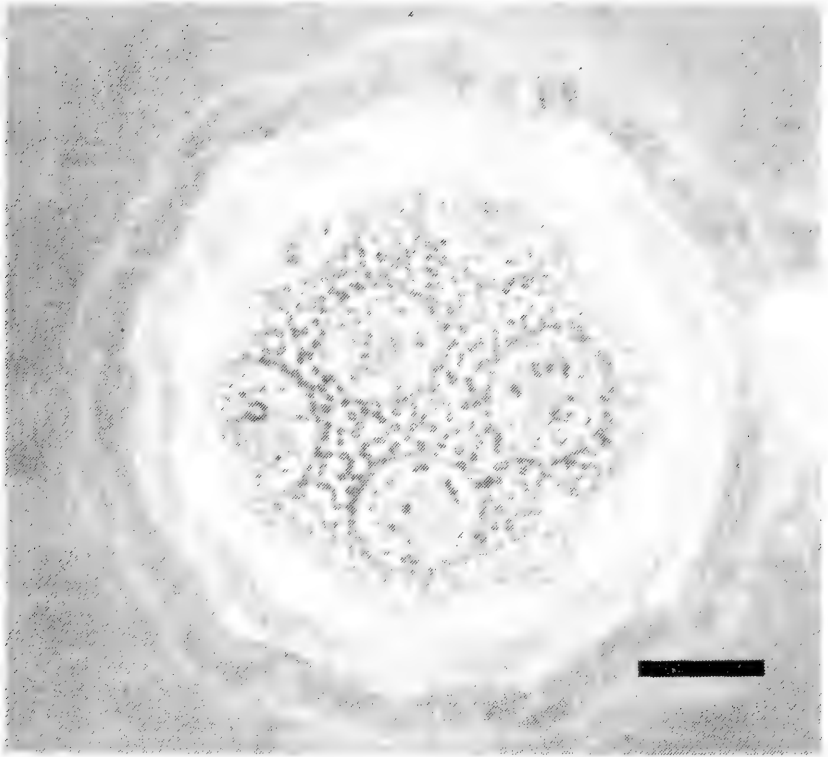


FIGURE 1. Phase contrast photomicrographs of pollen of Calandrinia sect. Pachypodae. Bar = 15 μ m.

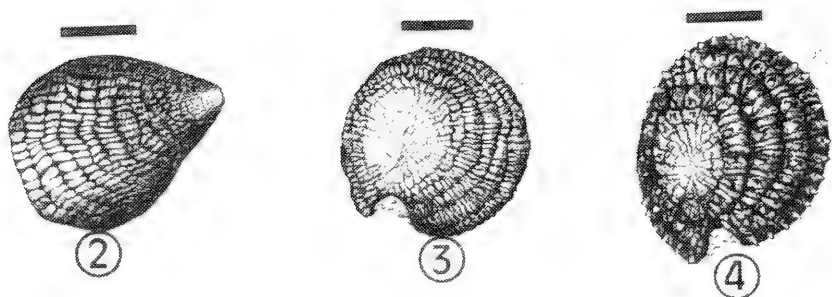


FIGURE 2-4. Seeds of *Calandrinia* sect. *Pachypodae*. 2. *C. galapoagosa*. 3. *C. pachypoda* subsp. *eyerdamii*. 4. *C. pachypoda* subsp. *pachypoda*. Bar = .34 mm.

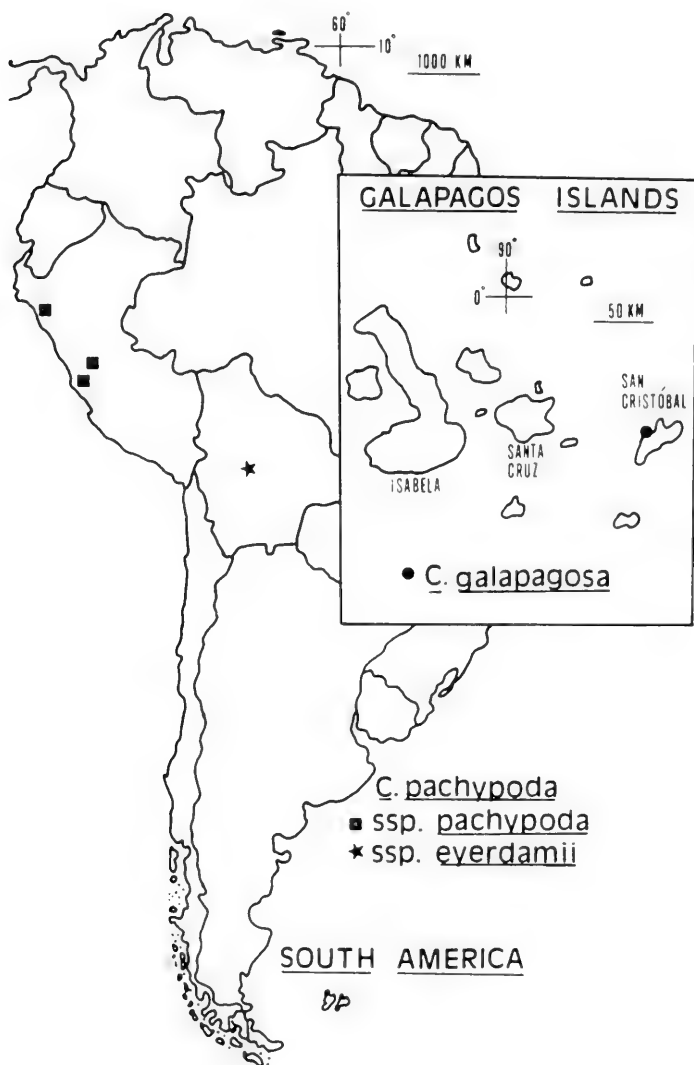


FIGURE 5. Distribution of Calandrinia sect. Pachypodae.

NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). XIX

Harold N. Moldenke

CLERODENDRUM Burm.

Additional bibliography: Baden-Powell, Handb. Econ. Prod. Punj. 1: 364. 1868; Aitchison, Cat. Pl. Punj. 121. 1869; Dutt, Mat. Med. Hind., ed. 1, 219 & 294. 1877; Backer, Tropische Natuur 5: 87--94. 1916; Buck & al., Bull. Torrey Bot. Club 112: 477. 1985; Mold., Phytologia 60: 128--152. 1986.

CLERODENDRUM HENRYI P'ei

Additional bibliography: Mold., Phytologia 60: 152. 1986.

This species is based on A. Henry 11585B [erroneously cited by P'ei as "11855B"] from Talang, Yunnan, China. P'ei (1932) comments that "The species is allied to *Clerodendron nutans* Wall. from which it differs by its much smaller flowers". He gives a very useful key for distinguishing the species of *Clerodendrum* known to him from China. It is reproduced here with some modifications and nomenclatural updating:

1. Corolla-tube short, not longer than 4 cm.
2. Calyx-rim truncate or minutely toothed, the teeth not longer than 1 mm.
3. Inflorescence usually consisting of simple, axillary, 3-flowered cymes; leaf-blades marginally entire..*C. inerme*.
- 3a. Inflorescence consisting of terminal, many-flowered panicles; leaf-blades variously dentate or serrulate.
4. Leaves plainly petiolate; panicles lax; bracts small, lanceolate, not more than 5 mm. long; ovary apically pubescent.....*C. subscaposum*.
- 4a. Leaves sessile or very shortly petiolate; panicles dense; bracts large, foliaceous, ovate, about 5 cm. long, sometimes verticillate; ovary glabrous.....*C. serratum*.
- 2a. Calyx distinctly lobed, the lobes to 1 cm. or more long.
5. Inflorescence terminal, composed of dense capitate cymes or lax many-flowered panicles.
6. Inflorescence dense, composed of globose cymose heads; bracts foliaceous.
7. Fruiting-calyx and bracts shorter than or as long as the fruit, with large peltate glands.
8. Style longer than the stamens; bracts persistent; southern.....*C. philippinum*.
- 8a. Style shorter than or as long as the stamens; bracts deciduous; northern.....*C. bungei*.
- 7a. Fruiting-calyx and bracts much longer than the fruit, without peltate glands.....*C. canescens*.
- 6a. Inflorescence loose, composed of lax cymes or elongated thyrsi; bracts small, linear.

- 9. Leaf-blades with numerous sand-like glands beneath.
 - 10. Normal leaf-blades not lobed, marginally serrate or dentate; stamens 3 times as long as the corolla-tube.
 - 11. Calyx and corolla usually red.....*C. japonicum*.
 - 11a. Calyx and corolla usually creamy-white.....*C. japonicum* f. *album*.
 - 10a. Normal leaf-blades usually distinctly 3--7-lobed, the lobes marginally entire or minutely denticulate; stamens 4 times as long as the corolla-tube. *C. paniculatum*.
- 9a. Leaf-blades without sand-like glands beneath.
 - 12. Corolla-tube short, not over 1 cm. long; flowers numerous
 - 13. Leaf-blades densely pubescent, broadly ovate; calyx-lobes slender, elongate.....*C. mandarinorum*.
 - 13a. Leaf-blades subglabrous, lanceolate-elliptic; calyx-lobes ovate.....*C. cyrtophyllum*.
 - 12a. Corolla-tube elongate, to 3.5 cm. long; flowers few.
 - 14. Leaf-blades elliptic-oblong to linear-oblong or lanceolate; bracts persistent.
 - 15. Inflorescence pendulous, the axis usually 15--35.5 cm. long.
 - 16. Leaves sessile or subsessile; petiole, if present, not over 13 mm. long.....*C. wallichii*.
 - 16a. Leaves distinctly petiolate; petioles 2.5--5.5 cm. long
 - 17. Leaf-blades linear-oblong, to 20 cm. long and 5 cm. wide; petioles 3--5.5 cm. long.....*C. longilimbium*.
 - 17a. Leaf-blades elliptic, usually not more than 10.5 cm. long and 5.5 cm. wide; petioles 1.5--3 cm. long.....*C. henryi*.
 - 15a. Inflorescence erect, the axis not over 4 cm. long.
 - 18. Leaf-blades subglabrous, ovate; flowers many; calyx green; corolla-tube not more than 2.5 cm. long.....*C. kwangtungense*.
 - 18a. Leaf-blades densely pubescent on the midrib beneath, elliptic; flowers few; calyx red; corolla-tube 3.5 cm. long.....*C. griffithianum*.
 - 14a. Leaf-blades ovate; bracts deciduous.
 - 19. Sepals reddish; leaf-blades ovate, more or less pubescent.....*C. trichotomum*.
 - 19a. Sepals greenish; leaf-blades ovate-lanceolate, subglabrous.....*C. trichotomum* var. *fargesii*.
- 5a. Inflorescence axillary, in few- or many-flowered cymes.
 - 20. Calyx with peltate glands.....*C. colebrokianum*.
 - 20a. Calyx without peltate glands.
 - 21. Leaf-blades ovate, glabrous; petioles about 10 cm. long...*C. longipetiolatum*.
 - 21a. Leaf-blades lanceolate, pubescent, subsessile or with petioles not over 5 mm. long.....*C. fortunatum*.
- 1a. Corolla-tube to 10 cm. long.....*C. indicum*.

Ching describes *Clerodendrum henryi* as a "climber" with greenish fruit in August, and asserts that it is "common" at 3200 feet altitude in Kwangsi.

Citations: CHINA: Kwangsi: Ching 6724 (V--9392). Yunnan: A. Henry 11585 (N), 11585B (N--type, W--458496--isotype). MOUNTED ILLUSTRATIONS: P'ei, Mem. Sci. Soc. China 1 (3): pl. 27. 1932 (Ld--photo of type).

CLERODENDRUM HETEROPHYLLUM (Vent.) R. Br. in Ait., Hort. Kew., ed. 2, 4: 64. 1812.

Synonymy: *Volkameria heterophylla* Vent. ex Poir. in Lam., Encycl. Méth. Bot. 8: 687. 1808. *Volkameria foliis ovatis, lanceolatis. seu lineari-lanceolatis, integerrimis; fructo globoso* Vent. ex Poir. in Lam., Encycl. Méth. Bot. 8: 687 in syn. 1808. *Clerodendrum heterophyllum* Ait. ex Steud., Nom. Bot., ed. 1, 207. 1821. *Clerodendron heterophyllum* R. Br. ex Spreng. in L., Syst. Veg., ed. 16, 2: 758. 1825 [not *Clerodendron heterophyllum* Miq., 1980]. *Clerodendrum heterophyllum* H. K. ex Loud., Encycl. Pl. 522. 1829. *Clerodendrum lanceolatum* Wall., Numer. List 87, no. 1790C hyponym. 1831. *Clerodendron ligustrinum* Wall., Numer. List. 87, no. 1790C hyponym. 1831. *Clerodendrum heterophyllum* R. Br. ex Bojer, Hort. Maurit. 256. 1837. *Clerodendron heterophyllum* "[R. Br.] in Ait." apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893. *Volkameria heterophylla* Poir. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1219 in syn. 1895. *Clerodendron heterophyllum* L. ex Hubert, Trav. Lab. Mat. Med. Fac. Pharm. Paris 13: 106. 1921. *Clerodendrum mauritanicum* Schum. ex Mold., Prelim. Alph. List Inv. Names 23 in syn. 1940. *Clerodendrum heterophyllum* (Poit.) R. Br. ex Mold., Alph. List Inv. Names 21 sphalm. 1942. *Clerodendron heterophyllum* Ait. ex Terrac., Trav. Lab. Mat. Med. 33 (3): 101. 1947. *Clerodendron lanceolatum* Wall. ex Mold., Fifth Summ. 2: 971 in syn. 1971 [not *Clerodendron lanceolatum* N. E. Br., 1959, nor Gürke, 1893]. *Clerodendron ligustrinum* Wall. ex Mold., Fifth Summ. 2: 971 in syn. 1971 [not *Clerodendron ligustrinum* R. Br., 1847, nor (Jacq.) Roem. & Schult., 1940, nor (Jacq.) R. Br., 1812]. *Clerodendron heterophyllum* Schau. ex Mold., Phytol. Mem. 2: 386 in syn. 1980.

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3: 214. 1863; J. G. Baker, Fl. Maurit. 254--255. 1877; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561 (1893) and imp. 1, 2: 1219. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 175. 1895; Gerth van Wijk, Dict. Plantnames, imp. 1, 1: 335. 1911; Perrot & Hubert, Bull. Sci. Pharm. 21: 449. 1914; Perrot & Hubert, Chem. Centralbl. 2: 47. 1915; Gerth van Wijk, Dict. Plantnames, imp. 1, 2: 176, 177, & 619. 1916; R. N. Parker, For. Fl. Punjab, ed. 1, 403. 1918; Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13: [Verb. Util. Mat. Méd.] [57], 103--105, & 128, pl. 5, fig. 5--8. 1921; R. N. Parker, For. Fl. Punjab, ed. 2, 403. 1924; Wehmer, Pflanzenst. 2: 1025. 1931; Mold., Alph. List Comm. Vern. Names 5 & 14. 1939; Mold., Geogr. Distrib. Avicenn. 29 & 37. 1939; Mold., Prelim. Alph. List Inv. Names 23 & 53. 1940; Mold., Alph. List Inv. Names 21 & 56. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 53, 69, 72, & 90. 1942; Mold., Phytologia 2: 99. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561 (1946) and imp. 2, 2: 1219. 1946; Mold., Alph. List Cit. 1: 30, 43, 116, 224, 256, & 277. 1946; Mold., Alph. List Inv. Names Suppl. 1: 6 & 29. 1947; Terrac., Trav. Lab. Mat. Med. Ecole Sup. Pharm. Paris 33 (3): 101. 1947; Mold., Alph. List Cit. 2: 353, 355, 356, 401, 414, 419, 457, 465, 481, 484, 487, 489, 558, 561--563, 565, & 566 (1948), 3: 715, 763, 783, 810, 844, & 934 (1949), and 4: 997, 1046, 1100--1103, 1120, & 1205. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 123, 152, & 158. 1949; Mold., Phytologia 4: 45. 1952; Mold. in Humbert, Fl. Madag. 174: 155, 237, 267, & 268. 1956; R. N. Parker, For. Fl. Punjab, ed. 3, 577. 1956; Mold., Résumé 155, 157, 158, 161, 208, 216, 264, 272, 273, 391, 392, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561 (1960) and imp. 3, 2: 1219. 1960; Gerth van Wijk, Dict. Plantnames, imp. 2, 1: 335 (1962) and imp. 2, 2: 176, 177, & 619. 1962; Nair & Rehman, Bull. Nat. Bot. Gard. Lucknow 76: [1], 14, & 16. 1962; Hyland, U. S. Dept. Agr. Pl. Invent. 173: 4. 1969; Gerth van Wijk, Dict. Plantnames, imp. 3, 1: 335 (1971) and imp. 3, 2: 176, 177, & 619. 1971; Mold., Fifth Summ. 1: 260, 264, 265, 272, 345, 358, 446, 462, & 463 (1971) and 2: 732, 733, 866, & 971. 1971; Farnsworth, Pharmacog. Titles 7 (7): iii & 395. 1972; Poisson & al., Ann. Pharm. Franç. 30: 241--254. 1972; Hegnauer, Chemotax. Pfl. 6 [Chem. 21]: 670. 1973; Mold., Phytologia 28: 448. 1974; [Farnsworth], Pharmacog. Titles 7 Cum. Gen. Ind. [31]. 1975; Mold., Phytologia 31: 391 & 396 (1975), 34: 273 (1976), and 36: 38 & 39. 1977; Mold., Phytol. Mem. 2: 249, 252, 254, 259, 334, 349, 386, 387, 392, 461, & 537. 1980; Sivarajan & Manilal, Journ. Econ. Tax. Bot. 3: 814. 1982; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 411 & 430--432. 1983; Mold., Phytologia 57: 483 (1985), 58: 181 & 189 (1985), and 59: 348, 349, & 463. 1986.

Illustrations: Hubert, Trav. Lab. Mat. Méd. Fac. Pharm. Paris 13: [Verb. Util. Mat. Méd.], pl. 5, fig. 5--8. 1921.

A low, bushy, much-branched, erect shrub or small tree to 3 m. tall, with rather straggly growth when not trimmed; branches quite twiggy, slender, gray, subterete or obscurely tetragonal, densely cinereous-puberulent, glabrescent in age, often prominently lenticellate; branchlets and twigs very slender, abbreviated, gray or

buff, acutely tetragonal, densely cinereous-puberulent; nodes often more or less partially annulate, those on larger branchlets marked with corky sterigmata 0.5--1.5 mm. long; principal internodes greatly abbreviated and only 1--9 mm. long on the twigs, to 8.5 cm. long on the larger branches; leaf-scars mostly elevated and conspicuously divergent, circular, corky-margined, not recurved nor spinescent; leaves decussate-opposite, approximate, or even ternate, often scattered, very numerous and crowded on the twigs; petioles varying from slender to filiform, 3--15 mm. long, very minutely puberulent or subglabrate, basally not at all amplexate; leaf-blades submembranous or very thinly chartaceous, rather uniformly bright-green on both surfaces or slightly lighter beneath, more or less brunnescent in drying, elliptic or lanceolate-elliptic to lanceolate, 1.1--9 cm. long, 1--3.6 cm. wide, apically acute or short-acuminate (rarely blunt) and apiculate, marginally entire or with 1 or 2 blunt lobe-like teeth above the middle or repand-dentate with widely separated, blunt, appressed teeth, basally acute or acuminate to cuneate, glabrate or subglabrate and densely punctate on both surfaces or very lightly pulverulent-puberulent on both surfaces when immature; inflorescence axillary, but aggregated near the tips of the twigs and appearing as though terminal, cymose, usually corymbose or corymbiform, 3--5 cm. long, 4--6 cm. wide, very lax, the cymes numerous, close together, decussate-opposite, mostly 2--4 cm. long and few-flowered, very loosely flowered, simple or 1 or 2 times dichotomous with a terminal flower in the center of each dichotomy, densely grayish-puberulent throughout; peduncles very slender or filiform, 1--3 cm. long, densely puberulent like the twigs; pedicels very slender or filiform, elongate, 3--19 mm. long, densely cinereous-puberulent, the longer pedicels usually on the central flower; bracts absent; bractlets and prophylla minute, inconspicuous, linear-subulate or setaceous, caducous, 1--3 mm. long, puberulent; calyx campanulate, brunnescent in drying, 2--4 mm. long and wide, externally very sparsely scattered-puberulous, its rim truncate and entire or subentire; corolla white, hypocrateriform, its tube narrow-cylindric, 4--11 mm. long, usually externally minutely pulverulent-puberulent or pubescent, hardly amplexate except at the extreme apex, the limb about 1 cm. in diameter in full anthesis, the 5 lobes subequal, oblong or obovate-oblong, 4--6 mm. long, 3 mm. wide, apically obtuse; stamens and style exerted 1 cm. or more from the corolla-mouth; filaments filiform; anther thecae oblong, parallel; style filiform, surpassing the stamens, 1.5 cm. long; pollen grains prolate, $61\text{ }\mu\text{m} \times 42\text{ }\mu\text{m}$ (range $55\text{--}64\text{ }\mu\text{m} \times 42\text{ }\mu\text{m}$), the apocolpium diameter $12.8\text{ }\mu\text{m}$; stigma bifid, the lobes lanceolate; ovary 4-ovulate; fruiting-calyx slightly incrassate, cupuliform, to about 5 mm. long and 10 mm. wide, glabrescent, mostly irregularly split to the base when the fruit is ripe; fruit drupaceous, subglobose, white, nigrescent in drying, the size of a small cherry or about 7 mm. long and wide, glabrous, deeply sulcate, spongy, juicy.

This species, based on an unnumbered specimen from the Isle de France [Mauritius] in the Desfontaines herbarium in Paris, is native to the Mascarene Islands, but is cultivated in many places in

India, Europe, South Africa, and elsewhere, mostly as a hedge or as a specimen plant. In Australia it is widely used as a hedge. The pollen is described in detail by Nair & Rehman (1962), based on NBG Dehra Dun 5675, slide 2659.

Poiret's (1808) description and commentary about this species are as follows: "Cette espèce, qui croît à l'Isle-de-France, où elle a été recueillie par M. Bory de Saint-Vincent, dans les lieux arides, non loin des bords de la mer, forme un arbrisseau glabre, & même un peu glauque, dont le bois est tortu & maigre, dont les feuilles varient dans leur forme, les unes étant ovales, d'autres lancéolées, d'autres, surtout les supérieures, linéaires-lancéolées, glabres, entières, aiguës, sans nervures sensibles, excepté celle du milieu. Les fleurs sont nombreuses, inodores, laterales, axillaires, disposées en corymbe trichotome; le pédoncule & les pédicelles glabres, cylindriques, filiformes, à peine de la longueur des feuilles; le calice glabre, tubulé, campaniforme, à cinq dents peu sensibles; la corolle d'un blanc de lait; les fruits globuleux. Cet arbuste croît à l'Isle-de-France, dans les lieux arides. ♀ (V. s. in herb. Desfont.)"

Collectors have encountered this plant in dry rocky places, high forests, and dry scrub near freshwater springs, from sealevel to about 15 m. altitude, in flower in January. The corollas are described as "white" on Barclay 1754, Clemens 43440 & s.n., and White 12401 and by most authors except Poiret (1808) who describes them as "milky white". Baker (1877) reports the species from the "dry hills of the Pouce range, etc." on Mauritius and affirms that it also grows on Réunion. Andersson refers to it as a "common native shrub in the lowlands" of Mauritius, where another collector refers to it as "a shrub of no importance".

Sivarajan & Manilal (1982) report that *C. heterophyllum* "has been found growing abundantly in [Kerala, India, and in] many other parts of Malabar except Calicut. Very often it is grown on hedges". Parker (1924) observes of it: "Indigenous to the Mascarenes. Occasionally grown in gardens in the plains [of the Punjab]."

It should also be noted here that the only Sivarajan material I have seen appears to be, not the typical form, but f. *angustifolium* Mold.

The Herb. Jard. Bot. Tananarive 2387, cited below, is from material "perhaps planted" along the road from Mandraka to Tamtave in Madagascar.

Vernacular and common names reported for this species are "bois cabri", "bois cabril", "bois cabris", "bois chenilles", "bois de bouc", "bois de chemille", "bois de chenilles", "gros bois de chenilles", "various-leaved clerodendron", "various-leaved clerodendrum", and "volkamier hétérophylle".

Sweet (1826) and Loudon (1832) report that the species was introduced into cultivation in England in 1805 from Mauritius; Voigt (1845) found it already in cultivation in the Calcutta area in 1845.

Wallich's two binomials, in the synonymy (above), are based on Wallich 1790C, a collection from Mauritius deposited in the Madras herbarium. The *Clerodendron heterophyllum* credited to Miquel, in

the same synonymy, is a synonym of *Peronema canescens* Jack.

Baker (1877) distinguishes the *Clerodendrum* species known to him from the Mascarene and Seychelles Islands as follows (with modifications and nomenclatural updating by myself):

1. Inflorescence corymbose.

2. Calyx-teeth obscure; leaves variable, the blades basally cuneate.

3. Corolla-lobes obovate-oblong.....*C. heterophyllum*.

3a. Corolla-lobes obovate.....*C. laciniatum*.

2a. Calyx-teeth large; leaf-blades basally rounded-cordate.....

C. philippinum.

1a. Inflorescence a thyrsoid panicle.....*C. serratum*.

Wehmer (1931) also reports *C. heterophyllum* from both Mauritius and Réunion, where, he says, it is employed medicinally as an anti-syphilitic. It contains some ethereal oil, but no alkaloids nor glycosides.

Hyland (1969) cites U. S. Dept. Agr. Pl. Introd. no. 303641 cultivated in Maryland, but originally from Uttar Pradesh, India.

The cultivated specimen so determined in the University of Karachi herbarium may possibly be *C. emirnense* Bojer; *Tepin s.n.* in the Vienna herbarium is a mixture with *C. emirnense* var. *diffusum* Mold.; and the Herb. Richard collection in the Stockholm herbarium is a mixture with *Vitex negundo* var. *heterophylla* (Franch.) Rehd.

Material of *Clerodendrum heterophyllum* has been misidentified and distributed in some herbaria as *C. aculeatum* (L.) Schlecht., *C. inerme* (L.) Gaertn., "*C. inerme* R. Br. (sens. lat.)", *C. laciniatum* Balf. f., *C. ligustrinum* (Jacq.) R. Br., *C. splendens* G. Don, *C. tomentosum* (Vent.) R. Br., *Manabea* sp., *Volkamera ligustrina* Jacq., *Volkamera angustifolia* Lam., *V. angustifolia* Poir., *V. ligustrina* Jacq., and *Volkamera* sp.

On the other hand, the *G. Gardner s.n.* [Mauritius] and *Sieber Fl. Maurit. 311*, distributed as typical *C. heterophyllum*, are what I now regard as its f. *angustifolium* Mold., while Herb. Crooke [Garden of Baron von Ludwig] is *C. emirnense* var. *diffusum* Mold.

Clerodendrum heterophyllum is obviously very closely related to *C. angustifolium* (Poir.) Spreng., *C. ligustrinum* (Jacq.) R. Br., and *C. aculeatum* (L.) Schlecht. and probably also to *C. emirnense* Bojer.

Citations: MADAGASCAR: Herb. Jard. Bot. Tananarive 2387 (P); *Tepin s.n.* [Herb. Reichenbach f. 134547 in part] (V). MASCARENE ISLANDS: Mauritius: N. J. Andersson 7 (S), 8 (S); *C. Barclay 1754* (W--2769466); *G. Barclay s.n.* (K); *Commerçon 257* (P), 258 (P); Herb. R. Brown s.n. (L); Herb. Buckley s.n. (E--118940); Herb. Cosson s.n. (P); Herb. Maurit. Bot. Gard. 39 (K); Herb. Portenschlag s.n. (V); Herb. Roy. Bot. Gard. Pamplemousses 47 (Ld--photo, N--photo, Na--27838); W. Hooker s.n. (L); Perrottet s.n. [Maurice] (P); Richard s.n. [Ile de France] (P); *Sieber Fl. Maurit. II. 158* (Br, K, L, L, L, L, Ld--photo, M, Mu--1684, N--photo, N--photo, P, V, V, V, V). RÉUNION: Boivin 1239 (N, P); Herb. Exp. Ser. For. Réunion 18547 (Lv); Richard 217 (P), 256 (P), 496 (P), s.n. [Bourbon] (P, P). INDIA: Maharashtra: H. R. Fernandez 2328 (Xa); Herb. Blatter 15025 (Xa), 28390 (Xa). CULTIVATED: Australia: Blackburn s.n. (T); M. S.

Clemens 43440 (Mi); *Flecker* s.n. [Cairns, 29.6.1935] (Qu); *C. T. White* 12401 (N). Austria: *Herb. Hort. Schoenbrunn* s.n. [1811] (V); *Herb. Jacquin* s.n. [794] (V); *Herb. Mertens* s.n. [Hort. Bot. Vin-dob.] (L). Belgium: *Herb. Pollart de Canidri* s.n. (Br). France: *Collector undetermined* s.n. (Dc); *Hardy* s.n. [Malmaison, 9 Aout 1822] (L); *Herb. Hort. Paris* s.n. [1828] (Br), s.n. [Aout 1846] (Cb); *Perottet* s.n. [Jardin des Pl., Paris, 1818] (Cb); *Thuillier* s.n. [Hort. Paris 1821] (Cb, Cb); *Weinkampf* s.n. [Jard. des Plantes] (Mu-1401). Germany: *Herb. Braun* s.n. (L); *Herb. Hort. Berol.* s.n. (L, N, V); *Herb. Hort. Bot. Imp. Pet. Mag.* s.n. [Hort. Heidelb., 10 Jul. 1834] (L, N); *Herb. Schimper* s.n. (Mu--1400); *Herb. Schrader* s.n. (L); *Otto* 1815 (B), s.n. [H. Berol.] (L). India: *Herb. Hort. Bot. Calcutt.* s.n. (Br, K, K, L, Mu--802, Ut--7393B); *Voigt* s.n. [H. B. Seramp.] (Cp, Cp); *Wallich* 557 (Cp, Cp, Dc), 1790/2 (L), s.n. [1830] (E--photo, K, Ld--photo, N--photo, S), s.n. [1832] (K), s.n. (Cp, Cp). Italy: *Herb. Harvey* s.n. [h. R. P. 1819] (Du); *Herb. Hort. Neapol.* s.n. [Nov. 1832] (Le). Russia: *Herb. Fischer* s.n. (L, L, L, L); *Herb. Hort. Bot. Imp. Pet. Mag.* s.n. [1835] (K, L, L); *Regel* s.n. [Herb. Bot. Petrop. 58.8] (L). Sri Lanka: *Collector undetermined* s.n. [Roy. Bot. Gard. Perad.] (Pd). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Reichenbach f.* s.n. [S. Amer.] (V); *Herb. Richard* s.n. (S); *Mollan* s.n. [1834] (Br); *Petit-Thouars* s.n. (P).

CLERODENDRUM HETEROPHYLLUM f. *ANGUSTIFOLIUM* Mold., *Phytologia* 3: 315. 1950.

Synonymy: *Volkameria angustifolia* Andr., *Bot. Repos.* 9: pl. 554. Dec. 1808 [not *V. angustifolia* Poir., Aug. 1808, nor Lam., 1825].

Bibliography: Andr., *Bot. Repos.* 9: pl. 554. Dec. 1808; Mold., *Phytologia* 3: 315. 1950; Mold. in Humbert, *Fl. Madag.* 174: 155, 237, & 267. 1956; Mold., *Résumé* 157, 158, & 450. 1959; Mold., *Fifth Summ.* 1: 264 & 265 (1971) and 2: 866. 1981; Mold., *Phytologia* 36: 39. 1977; Mold., *Phytol. Mem.* 2: 252, 254, 259, 340, 349, & 537. 1980; H. N. & A. L. Mold. in Dassan. & Fosb., *Rev. Handb. Fl. Ceyl.* 4: 431. 1983; Mold., *Phytologia* 58: 189. 1985.

Illustrations: Andr., *Bot. Repos.* 9: pl. 554 (in color). 1808.

This form differs from the typical form of the species in having the leaf-blades linear, less than 10 mm. wide at the mid-point.

The form is based on an unnumbered G. Gardner collection from near Port Louis, Mauritius, deposited in the Kew herbarium, and is known definitely by me only from Mauritius and Réunion, where it is apparently native, but it has been introduced and become naturalized in parts of India and Australia.

Many herbarium specimens of typical *C. heterophyllum* (Vent.) R. Br. have this narrow-leaved form mounted on the same sheet with the ordinary broad-leaved form. They are, however, always on separate branchlets or twigs, so it is not at all clear whether they came from the same plant or not.

The *Volkameria angustifolia* credited to Lamarck and to Poirét in the synonymy (above) are synonyms of *Clerodendrum angustifolium* (Poir.) Spreng., which see.

Collectors have encountered *C. heterophyllum* f. *angustifolium* along roadsides (in Kerala, India), in flower in October, the corolla

described as "white" by Sivarajan. It is said by Clemens to be a common hedge plant in Queensland, Australia, and it is possible that all her material cited below from that country was actually from cultivated material. Her no. 44239 is a mixture with *Duranta repens* L. and the term "treelet" on her accompanying label may refer to either part of the material. She also refers to the corollas as "white" and found the plant in anthesis in April.

This form, as well as *C. heterophyllum* itself, is certainly closely related to *C. angustifolium* (Poir.) Spreng. Material has been misidentified and distributed in some herbaria as typical *C. heterophyllum* (Poir.) Spreng., *C. commersonii* Spreng., *C. neriifolium* Wall., and *Manabea* sp.

Citations: MASCARENE ISLANDS: Mauritius: N. J. Andersson s.n. [Mauritius] (S); G. Gardner s.n. [Mauritius] (K--type, Ld--photo of type, N--fragment of type, N--photo of type); Herb. Mus. Paris s.n. [Ile de France] (P); Richard s.n. [Ile de France] (P); Sieber Fl. Maurit. II.311 (L, Ld--photo, N--photo, V). RÉUNION: Desvieux 19 (P); Herb. Mus. Paris s.n. [Bourbon] (P); Richard s.n. [Bourbon] (P, P). INDIA: Kerala: Sivarajan 1228 (Ld, Uc). GREAT BARRIER REEF: Stradbroke: M. S. Clemens 44239 in part (Mi). CULTIVATED: Bribie Island: M. S. Clemens 44058 (Mi). Queensland: M. S. Clemens 42078 (Mi), s.n. [Nov. 21, 1945] (Or--53474). LOCALITY OF COLLECTION UNDETERMINED: Petit-Thouars s.n. (P).

CLERODENDRUM HETEROPHYLLUM var. *BAUERI* Mold., Phytologia 4: 127. 1952.

Bibliography: Mold., Phytologia 4: 127. 1952; Mold., Biol. Abstr. 27: 984. 1953; Mold., Résumé 208 & 450. 1959; Mold., Fifth Summ. 1: 345 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 334 & 537. 1980; H. N. & A. L. Mold. in Dassan: & Fosb., Rev. Handb. Fl. Ceyl. 4: 432. 1983.

This variety differs from the typical form of the species in having the calyx-rim distinctly toothed, the teeth short and triangular.

The variety is based on a series of drawings made from living plants at Keppel Bay, Queensland, Australia, by Ferdinand Lucas Bauer between 1801 and 1803 and deposited in the herbarium of the Naturhistorisches Museum in Vienna, drawing 968a being regarded by me as the actual type (holotype). One of the drawings was submitted to the Royal Botanic Gardens at Kew where Dr. R. Melville studied it. His report to me is that it does not match any material in the Kew herbarium of any known Australian species. He thinks that the plant depicted by Bauer may have been a hybrid between "*C. hemiderma*" [now known as *Glossocarya hemiderma* (F. Muell.) Benth.] and *C. floribundum* R. Br. It seems more likely to me that it represents a variety of the very variable *C. heterophyllum* (Vent.) R. Br. with whose broad-leaved typical form it agrees almost perfectly in all characters except the plainly short-toothed calyx-rim.

Citations: AUSTRALIA: Queensland: F. L. Bauer icon 968a (Ld--photo of type, N--photo of type, V--type), 968/969 (V), 1591/1 (V).

CLERODENDRUM HETTAE H. Hallier, Meded. Rijks Herb. Leid. 37: 82--83. 1918.

Synonymy: *Clerodendron hettiae* Hall. f. apud H. J. Lam, Verbenac. Malay. Arch. 316. 1919. *Clerodendron speciosissimum* f. *macrocalyx* Bakh. ex Mold., Résumé 269 in syn. 1959.

Bibliography: H. Hallier, Meded. Rijks Herb. Leid. 37: 82--83. 1918; H. J. Lam, Verbenac. Malay. Arch. 316 & 363. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 77, 94, 109, & ix. 1921; A. W. Hill, Ind. Kew. Suppl. 6: 49. 1926; Beer & Lam, Blumea 2: 224. 1936; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 20. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 66 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 57. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 147 & 181. 1949; Mold., Résumé 197, 269, & 450. 1959; Mold., Fifth Summ. 1: 330 & 456 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 320 & 537. 1980; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 446. 1983; Mold., Phytologia 58: 216 (1985) and 59: 340. 1986.

A shrub, 1--2 m. tall, mostly quite glabrous; branches stout, 3.5--7 mm. in diameter, glabrous, the younger ones terete and green, the older ones woody, obtusely tetragonal, fistular, ochraceous, dark, verruculose with orbicular lenticels; leaves decussate-opposite, large; petioles 3.5--30 cm. long, terete, glabrous, slightly longitudinally sulcate-flattened between 2 parallel ridges above; leaf-blades chartaceous, obcordate or the upper ones ovate, equaling or shorter than the petiole, 9--28 cm. long, 7--20 cm. wide, apically acutely short-acuminate, marginally entire, basally rather deeply and widely cordate, green above, much paler beneath, glabrous on both surfaces (except for the venation), pinnately and basally subpalmately veined, under a handlens squamulose-punctulate throughout above, minutely glandular-punctate beneath and especially along the larger venation sparsely marked with larger discoid glands; secondaries 7 or 8 per side, irregular, subclathrate, arcuately joined near the margin, otherwise semi-pinnate, papillose-puberulous on both surfaces; inflorescence terminal, paniculate, very showy, fastigiate, glabrous, the ramifications decussate, terminating in 2 many-flowered cincinni beneath the central flower; bractlets small, spatulate-linear, about 1 cm. long, 1--2 mm. wide; pedicels subclavate, 2--8 mm. long, much shorter than the calyx; calyx large, membranous or subchartaceous, pale-green or reddish to orange-red, during anthesis 1.8--2.5 cm. long and 1.2--1.7 cm. wide, irregularly parallel-veined, externally glabrous, glandular-punctulate throughout and also punctate with a few larger glands, trifid to about 1/3 down, the lobes ovate, unequal, 2 of them (the anterior ones?) much broader and apically acute or sometimes apically minutely bidentate, the third one acuminate; corolla hypocrateriform, red or orange-red to flesh-color, glabrous, the tube 2.5--3.3 cm. long, half longer than the calyx, basally slender and cylindric, 2 mm. in diameter, but amplified apically to 3 mm. and there narrowly infundibular, the lobes oblong, 2--2.5 cm. long and 1--1.1 cm. wide, apically obtuse or subacute; stamens inserted in the upper part of the corolla-tube, about 2.5 cm. long, exserted, slightly surpassing the corolla-lobes;

anthers oblong, 3.5 mm. long, the lower $\frac{1}{2}$ divaricate; style exerted 2.2--2.7 cm.; stigma shortly bifid; fruiting-calyx somewhat accrescent, fleshy, patulous, blood-red; fruit drupaceous, globose, 6 mm. long, 6--7 mm. wide, included by the fruiting-calyx, externally glabrous, 4-lobed.

This species is based on *Elbert 644, 776, 1814, 1914, 1946, & 1978* from Lombok, in the Lesser Sunda Islands, at 150--900 m. altitude, in flower and immature fruit in April and June, deposited in the Senckenberg, Buitenzorg, and Leiden herbaria. The collector notes that in April in one case the apparently ripe fruit had already been devoured by birds. Hallier (1918) also comments that "Zur selben Art gehört offenbar auch *Zollinger no. 2557 ZM z. Theil* ('in collibus ins. Lombok, VII.1846'), im Hb. L.-B. aber nur mangelhaft vertreten. Ich benenne die Pflanze, die vielleicht von allem Arten der Gattung die schönsten und grössten Blüten besitzt, an Ehren der Frau Dr. Hetta Elbert, die ihren Gatten auf allen seinen Streifzügen über die kleinen Sunda-inseln und durch New-Kamerun als getreue Mitarbeiterin begleitet hat".

Beer & Lam (1936) remark that this species "shows in its calyx and corolla some relations to *Faradaya*", and that it is related closely to *C. elberti* H. Hallier and *C. brassii* Beer & Lam.

Iboet describes the corollas as "red", while Bloembergen refers to them as "orange-red". The plant has been found in anthesis in February, April, and June.

Bakhuizen's *C. speciosissimum f. macrocalyx* seems to be based on *Iboet 297* from Soemba.

Citations: LESSER SUNDA ISLANDS: Lombok: *Bloembergen 2023* (Bz--72640, Bz--72641); *A. Ernst s.n.* [29.III.06] (Bz--19373, N); *Rensch-Maler 90* (Bz--19375, Bz--19376, Bz--19377); *Voogd 2074* (Bz--19374, Ld--photo, N--photo). Soemba: *Iboet 297* (Bz--20591).

CLERODENDRUM HEXANGULATUM Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 102--103. 1936.

Synonymy: *Clerodendron hexangulatum* Berthold Thomas apud Hill & Salisb., Ind. Kew. Suppl. 10: 55. 1947.

Bibliography: B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 13, 40, 70, 93, & 102--103. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 47 & 90. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 55. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 113 & 181. 1949; Mold., Résumé 139 & 450. 1959; Mold., Fifth Summ. 1: 223 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 214 & 537. 1980.

A scandent shrub; branches hexangular, subglabrous, spinose; branchlets rounded-hexangular, hispid; leaves ternate; petioles 0.5--1.5 cm. long, hirsute or glabrous, articulate, the lower 2 cm. recurved, spinescent, the upper portion deciduous; leaf-blades membranous, obovate-rotund, 5--9 cm. long, 3--6 cm. wide, apically acuminate (the acumen itself apically subobtus), marginally entire, basally rotundate-cuneate, glabrous above, pubescent beneath; inflorescence cymose-paniculate, often foliose, composed of axillary cymes, with elongate sympodia, including the uppermost leaves which notably decrease in size or sometimes are all bract-like, the axil-

lary cymes ternate, aggregate, the lower ones 2--2.5 cm. long; peduncles to 1 cm. long; pedicels 1--3 mm. long; bracts and bractlets small, subulate, hispidulous; calyx narrowly conic-tubular, almost cylindric, 7--8 mm. long, externally hispidulous-pubescent, 5-dentate to about 1/5 the length, the teeth acutely deltoid; corolla-tube about 1.6 cm. long, basally and apically dilated, the limb 4- or 5-lobed, bilabiate, the lobes ovate-oblong, subequal, about 3 mm. long, reclinate; stamens exserted; filaments about 2.2 cm. long, subequal, inserted at about 2/3 the length of the corolla-tube; anthers 1 mm. long; style about 1.8 cm. long; stigma bifid, the lobes 1 mm. long; ovary 1.5 mm. long, dark-fusces, externally glabrous; mature fruit not known.

This species is based on *Mildbraed* 5423 from "im grossen Dscha-Bogen", Lomie district, in the South Cameroons forest area, collected on May 23, 1911, and deposited in the Berlin herbarium, now probably destroyed. Thomas (1936) cites also *Tessmann* 2758 from the Cameroons.

Nothing is known to me of this species beyond what is stated in its meager bibliography (above).

CLERODENDRUM HILDEBRANDTII Vatke, *Linnaea* 43: 536--537 [as "*Clerodendron*"]. 1882; B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 67 & 93. 1936.

Synonymy: *Clerodendron hildebrandtii* Vatke, *Linnaea* 43: 536. 1882. *Clerodendrum hildenbrandia* Jaasund, in herb.

Bibliography: Vatke, *Linnaea* 43: 536--537. 1882; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 561. 1893; Gürke in Engl., *Pflanzenw. Ost-Afr. C.* 341. 1895; J. G. Baker in *Thiselt.-Dyer, Fl. Trop. Afr.* 5: 294 & 302--303. 1900; Chiov., *Result. Scient. Miss. Stef.* 1: 143. 1916; Chiov., *Fl. Somalia* 1: 63 (1929) and 2: 362. 1932; B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 6, 7, 21, 38, 67, & 93. 1936; Worsdell, *Ind. Lond. Suppl.* 1: 238. 1941; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 49, 50, & 90. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 561. 1946; Glover, *Prov. Check List Brit. Ital. Somal.* 266. 1947; Mold., *Alph. List Cit.* 2: 537. 1948; H. N. & A. L. Mold., *Pl. Life* 2: 64. 1948; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 116, 117, & 181. 1949; Mold., *Résumé* 144, 145, & 450. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 561. 1960; Dale & Greenway, *Kenya Trees Shrubs* 582 & 584. 1961; Cuf., *Bull. Jard. Bot. Brux.* 32: Suppl. 799. 1962; Mold., *Résumé Suppl.* 13: 4 (1966) and 15: 8. 1967; Gillett, *Numb. Check-list Trees Kenya* 46. 1979; Mold., *Fifth Summ.* 1: 235, 239, 240, & 251 (1971) and 2: 866. 1971; Mold., *Phytol. Mem.* 2: 204, 225, 229, 230, 240, & 537. 1980; Reis & Lipp, *New Pl. Sources Drugs* 251. 1982; Mold., *Phytologia* 53: 197 (1983), 57: 34 (1985), 59: 254 & 259 (1986), and 60: 138. 1986.

Illustrations: Chiov., *Fl. Somalia* 2: 362. 1932.

A moderate to large bush, much-branched shrub, or tree, to 10 m. tall, rather succulent, often growing in groups; stems single or many, green, smooth; branches laxly spreading, striate, glabrous; bark rough, corrugated, pale-brown, finely reticulate; branchlets

woody, tetragonal, pale, glabrous; sap colorless; leaves decussate-opposite, thick and somewhat fleshy when fresh, "sticky" [fide Tanner], brittle when dry, long-petiolate; petioles 4--4.7 cm. long, glabrous; leaf-blades membranous, broadly oval or ovate to broadly elliptic, 5--6.5 cm. long, 5--7 cm. wide, marginally entire, basally rounded to subcordate or the lowermost cordate, pale dull-green on both surfaces, thick and fleshy when fresh, glabrous on both surfaces; cymes axillary, long, very open, pedunculate, 3-flowered, forming a few-flowered terminal panicle, surpassing the leaves; peduncles about 2 cm. long; pedicels very slender, to 1 cm. long, often longer than the calyx; flowers regular, very large, odorless or aromatic (depending on the time of day?); calyx tubular-subcampanulate, 0.8--1.2 cm. long, green but basally tinged dull-purplish, 5-dentate or -lobed, externally glabrous, the teeth or lobes ovate, red-tinged, much shorter than the tube, apically acute; corolla hypocrateriform, white or cream-color, tinged mauve when fading, the tube slender, slightly curvate, 2.5--3 cm. long, about 3 times as long as the calyx, apically dilated, externally sparsely pilose, the limb about 1.5 cm. wide, the lobes subequal, 0.8--1.2 cm. long; stamens twice as long as the corolla-tube; filaments apically pink or mauve, basally white; anthers pale-brown or brown-red; pollen yellow; style pink or white, apically mauve or reddish; fruiting pedicels subincurved; fruit drupaceous, globose, at first green, later black, shiny, enclosed by the fruiting-calyx when immature, unpleasantly aromatic; seeds oblong, glabrous.

This species is based on *Hildebrandt 2389* from Ndara in Teita, in south-southeastern Ethiopia, collected in February, 1877. Vathek (1882) comments about it: "*C. trifloro* Vis. (fide Schweinfurth ms.) simile, foliis integerrimis in petiolum haud decurrentibus diversam. In systemata schaueriano ad *Euclerodendron* §1. pertinet."

Collectors have encountered this plant in secondary forests, woodlands, bushland, and thickets, on river flats, in regenerating cultivated areas, by hot springs, in coppices, at the edges of forest patches and thickets, in light forests, on tree savannas dominated by *Acacia* and herb savannas dominated by *Digitaria*, *Echinochloa*, and *Panicum*, and in heavy black fissuring soil or rich, red, brown, or black loam, as well as in gray sandy-clay areas periodically inundated, at 10--600 m. altitude, in flower in February, April to June, November, and December, and in fruit from June to September and November.

Polhill & Paulo found it growing "on sandy soil in disturbed bush around cultivation with *Adansonia*, *Lannea*, *Sterculia*, *Markhamia*, *Grewia*, *Thespesia*, *Allophylus*, etc." in Kenya. In Tanganyika Schlieben reports it "scattered" or "common", while Drummond & Hemsley describe it as "scattered in shrub thickets on shrub- and small-tree grasslands". Gürke (1895) refers to it in East Africa as "Sowohl auf feuchten Grassflächen am Meeresstrande, als auch im lichten Gebüsch, überall häufig, wie es scheint".

The corollas are described as "white" by Baker (1900) and on Drummond & Hemsley 3533, Peter 16608, Proctor 2587, Schlieben 2546, Tanner 2568, 2903, 3412, 3473, 3767, & 3788, "pure-white" on

Faulkner 597, "milk-white" by Gürke (1895) and Vatke (1882), "dirty-white" on Peter 15148, "cream" on Drummond & Hemsley 3037, "cream, tinged mauve when fading" on Polhill & Paulo 743, "yellow" on Barbosa 2393, "blue" on Tanner 3328, and "violet" on Tanner 3103 [I suspect that the last two of these are errors in observation and/or in transcription for fruit color].

Vernacular names reported for *C. hildebrandtii* are "kuwakilo", "kuwkilo", "kwakiyo", "mbwakaba", "mbwakabaka", "mkornudo", "mkua-usiku", "mkula-usiku". "mkusakilo", "mkuwakilo", "mpewa", and "mtozatoza".

Chiovenda (1916) records *C. hildebrandtii* from what was then Italian Somaliland. Dale & Greenway (1961) assert that it occurs in bush and grassland in the Coast Province of Kenya, citing Battiscombe 33 & 462, Graham 2165 & 2311, Hildebrandt 2389, and Kirk s.n. Tanner (1982) cites Tanner 3412 & 3767; Cufodontis (1962) cites only Hildebrandt 2389, giving the plant's distribution as both sides of the Juba River in Ethiopia and also in "Tropical Africa".

Baker (1900) cites from Kenya Hildebrandt 2389, Kirk s.n., and Wakefield s.n. and from Tanganyika Hannington s.n. and Holst 2000.

Thomas (1936) cites from Kenya Hildebrandt 2389, Kirk s.n., Thonner 21 & 11.82, and Wakefield s.n. and from Tanganyika Braun 1512, 1791, 3411, & 3487, Goetze 77, Hildebrandt 1270, Holst 1253a & 2200, Merker 725, Schlieben 5725 & 6007, Stuhlmann 6, 117, 6955, 8041, & 1.578, and Zimmermann 149.

Tanner informs us that the roots of this plant are boiled and the resulting decoction is then drunk to treat heartburn and stomach ache. Graham says that the leaves are pounded and "used as fish bait" [fish stupification poison?].

Keys to help distinguish this species from other African taxa will be found in the present series of notes under *C. dinklagei* Hürke [59: 254] and *C. discolor* (Klotzsch) Vatke [59: 259].

It may be worth mentioning that the Barbosa 2393, cited below, is a good match for Hildebrandt 1270 in the British Museum herbarium, while Torre & Paiva 9613 was examined by Sir George Taylor, who reports in a personal communication to me, dated June 13, 1966, that "this gathering compares well with the copious Kenya and Tanganyika material present in the Kew herbarium".

The Tanner 1664, distributed as *C. hildebrandtii*, actually is the type collection of its var. *pubescens* Mold., which see.

Citations: TANZANIA: Tanganyika: K. Braun s.n. [A. Peter 51803] (B), s.n. [A. Peter 51868] (B); Drummond & Hemsley 2353 (B, S), 3037 (B, S), 3533 (B, S); H. G. Faulkner 597 (S); Holst 2203 (Mu--1743); Jaasund 2153 (Go); Merker 725 (B); A. Peter 13709 [O.III.182] (B), 15148 [O.III.243] (B), 16608 [O.IV.49] (B), 20457 [O.IV.187] (B), 20577 [O.IV.191] (B), 20702 [O.IV.192] (B), 23682 [O.IV.310] (B), 24899 [O.IV.343] (B), 40550 [V.241] (B); Proctor 2587 (W--2892774); Schlieben 2546 (Br, N, S), 5725 (Br), 6007 (Br, Ld--photo, N--photo); Tanner 2568 (Ba, Mi, N), 2923 (Ba, Ca--180713, N, S), 3328 (Ba, Mi, N), 3412 (Ba, Mi, N), 3474 (Ba, N), 3767 (Ba, Mi, N), 3788 (Ba); Zimmermann s.n. [A. Peter 13982; O.III.194] (B). Zanzibar: Hildebrandt 1270 (L, Ld--photo, N, N--photo, V); Tanner 3103

(Ba, N). KENYA: R. M. Graham 2165 (Af); Napier 6329 (Br, N); Polhill & Paulo 743(S); Thomas 11.82 ["Thonner 11.82"] (Br, N); Wall B. 5993 (Ew). MOZAMBIQUE: Cabo Delgado: Torre & Paiva 9613 (Ul). Moçambique: Barbosa 2393 (Ul).

CLERODENDRUM HILDEBRANDTII var. *PUBESCENS* Mold., Phytologia 53: 197. 1983.

Bibliography: Mold., Phytologia 53: 197. 1983.

This variety differs from the typical form of the species in having the stems, branches, petioles, peduncles, pedicels, calyx, and lower leaf-surfaces densely short-pubescent.

The variety is based on *Tanner 1664* from black loam in grass around a grove of palms along the Sereneta River, Banagi area, Ikoma Chiefdom, Musomi District, in the Serengeti National Park, Lake Province, Tanzania, at 4500 feet altitude, collected on November 4, 1953, and deposited in the University of Michigan herbarium. The collector describes the plant as growing in groups 3 feet tall, the stems hollow, single, erect, the sap colorless, the flowers aromatic and the corollas white.

Thus far the variety is known to me only from the original collection, but its general resemblance to *C. rotundifolium* Oliv., with which it has previously been confused, is remarkable. It deserves further study. *Egglesing 6823* probably represents the same taxon.

Citations: TANZANIA: Tanganyika: *Tanner 1664* (B--isotype, Ba--isotype, Mi--type).

CLERODENDRUM HIRCINUM Schau. in A. DC., Prodr. 11: 661 [as "*Clerodendron*"]. 1847; Mold., Geogr. Distrib. Avicenn. 37. 1939.

Synonymy: *Clerodendron hircinum* Schau. in A. DC., Prodr. 11: 661. 1847. *Webera axillaris* Lyall ex Mold. in Humbert, Fl. Madag. 174: 244 in syn. 1956.

Bibliography: Schau. in A. DC., Prodr. 11: 661. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 106. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 175. 1895; Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 53, 72, & 90. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561. 1946; Mold., Alph. List Cit. 1: 31 & 36 (1946) and 3: 685 & 917. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 123, 158, & 181. 1949; Mold., Biol. Abstr. 26: 145. 1952; Mold., Phytologia 4: 45. 1952; Mold. in Humbert, Fl. Madag. 174: 149, 155, 244--248, 266, & 267, fig. 40 (1--5). 1956; Mold., Résumé 155, 216, 393, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561. 1960; Mold., Fifth Summ. 1: 260 & 358 (1971) and 2: 735 & 866. 1971; Fournet, Fl. Illust. Phan. Guad. 1418. 1978; Mold., Phytol. Mem. 2: 249, 349, & 537. 1980; Mold., Phytologia 58: 181 & 190. 1985.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 247, fig. 40 (1--4). 1956.

A shrub or small tree, 1--4 m. tall, or high-climbing liana; stems and branches rather slender, obtusely tetragonal, very densely short-pubescent with flavidous or fulvous spreading hairs, less so

in age, not very twiggy; branchlets slender, obscurely tetragonal or subterete, densely short-pubescent with brown spreading hairs or puberulent, becoming less so in age or even glabrescent; nodes not annulate; principal internodes 1.5--6 cm. long; leaf-scars mostly very prominent, sometimes 2--8 mm. long and curved in spine-like fashion; leaves decussate-opposite or approximate; petioles slender, 0.3--2.5 cm. long, rather densely short-pubescent like the branches or somewhat less so, with spreading brown hairs, usually the basal 1--4 mm. persisting as a spine-like, divergent or recurved projection (or sometimes these spines are replaced by large, flattened, corky-margined leaf-scars); leaf-blades usually membranous, sometimes chartaceous or even very firm and stiff, uniformly green on both surfaces or bright-green above and lighter beneath, mostly fragile when dry, shiny, varying from elliptic to obovate-elliptic or obovate, 1.5--19 [usually 4.5--10] cm. long, 1--11.5 [usually 2--5] cm. wide, apically mostly short-acuminate or cuspidate, more rarely acute to rounded or even emarginate, marginally mostly entire or subentire or with a few undate-sinuate or sinuate-dentate leaves interspersed among the entire ones, basally acute or shortly subacuminate, sparsely pilosulous above when young, becoming densely pustulate-puberulent, often more or less strigillose along the venation above when mature and often also sparsely strigillose on the lamina as well, varying from densely short-pubescent throughout beneath to merely puberulent-strigillose along the venation or pilosulous and punctate; midrib slender, flat above, prominent beneath; secondaries slender, 5--9 per side, arcuate-ascending, rather irregularly arcuate-joined near the margins beneath, flat (or subprominulous on heavy leaves) above, prominulous or subprominulous beneath; vein and veinlet reticulation rather abundant, fine, the larger parts often slightly subprominulous above, varying to obscure or even indiscernible on thinner leaves, all flat or prominulous beneath, often obscure; inflorescence axillary and terminal, cymose, the very numerous cymes usually aggregated at the tips of the branches and forming an elongated panicle to 20 cm. long and 8.5 cm. wide; cymes mostly divaricate-ascending, solitary, opposite or often supra-axillary by several mm., 2.5--7 cm. long, many-flowered, rather loose, 2--5 cm. wide, densely puberulent throughout; peduncles slender, compressed, 1--6 cm. long, very densely short-pubescent with spreading fulvous or flavidous hairs like the many sympodia and cyme-ramifications; pedicels slender, 1--5 mm. long, densely flavidous-pubescent; bracts often large and foliaceous in the terminal panicle, resembling the leaves in all respects but smaller, subtending the uppermost cymes, caducous; bractlets linear, 2--5 mm. long, very densely yellowish-pubescent; prophylla setaceous, about 1 mm. long, densely yellowish-pubescent or puberulent; calyx broadly campanulate, lightly chartaceous, 4--6 mm. long, 3--9 mm. wide, externally more or less puberulent, not at all nigrescent in drying, its rim deeply 5-lobed, the lobes triangular-ovate, stramineous or yellowish, often as long as the tube, apically attenuate-subacuminate; corolla hypocrateriform, white or greenish-yellow, its tube narrow-cylindric, 7--9 mm. long, externally glabrate or apically very sparsely puberulent, the limb 5-lobed,

the lobes about 3 mm. long, apically obtuse, dorsally densely short-pubescent; stamens and style exserted 4--5 mm. from the mouth of the corolla-tube, glabrous; fruiting pedicels slender, to 11 mm. long, densely short-pubescent with yellowish or fulvous spreading hairs; fruiting-calyx incrassate, campanulate, the tube 6--7 mm. long and wide, puberulent but less so apically, the lobes ovate, about 3 mm. long and wide, slightly puberulent; fruit drupaceous, oblong-sub-globose, blue, about 8 mm. long and wide, nigrescent, plainly sulcate, externally glabrous.

This endemic Madagascan species is based on an unnumbered Bojer collection from the Ermin region of Madagascar, deposited in the De Candolle Herbarium in Geneva. Schauer (1847) comments: "Affinis et similis *C. putri*, sed pube, calyce et corollâ valde distincta. 'Planta odore gravissimo praepollens'. Folia in nostra bipollicaria, complicata. Calyx in limbum conspicue dilatatus, 2 lin. longus. Cor. infundibularis, 4 lin. longa. Genitalia exserta."

The ultimate large dimensions given in my description (above) for the leaf-blades are taken from the obovate leaves mounted with *Chapelier 91*, but it is not certain that these detached leaves actually belong to the *C. hircinum* specimen; they differ not only in their large size, obovate shape, and in being brunnescent above and densely pubescent beneath, but also in the character of the whole venation on both leaf-surfaces.

Clerodendrum hircinum is endemic to Madagascar, but is known from cultivation in Martinique and possibly also in France (and perhaps elsewhere). Collectors have encountered it in forests and cloud-forests, in rich alluvium, and on gneiss laterite, at 50--2500 m. altitude, in flower in May, June, July, and September, and in fruit in August.

The corollas are described as having been "white" on *Decary 14334*, *14347*, & *17910*, *Gentry 11654*, *Humbert & Swingle 4836*, and *Perrier 16435*, "pure-white" on *Viguier & Humbert 202*, and "greenish-yellow" on *Goudot s.n.*

The *Bélanger 195* collection from Martinique, cited below, does not actually have any indication on its label that it came from cultivated material, but I am assuming that it did.

Material of *C. hircinum* has been misidentified and distributed in some herbaria as *Volkameria* sp. or even as something in the *Rubiaceae*.

A key to distinguish this species from its relatives in Madagascar will be found in the present series of notes under *C. baronianum* Oliv. [58: 190].

Citations: MADAGASCAR: *Afzelius s.n.* [Tamatave, 22.8.1912] (S); *Baron 2531* (K, P), *2752* (K, P); *Boivin 1798* (P), *s.n.* [Madagascar, 1847--1852] (P); *Bréon 3* (P); *Catât 1707* (P); *Chapelier 91* (P); *Decary 4795* (P), *5383* (P), *7064* (P), *14334* (P), *14347* (N, P), *17910* (P); *A. Gentry 11654* (E--2737590); *Goudot s.n.* [environs de Tamatave, Aout 1830] (P); *Herb. Hooker s.n.* [July 1832] (K); *Herb. Jard. Bot. Tananarive 2798* (P); *Herb. Mus. Paris s.n.* [Exposition Coloniale de Marseille] (P); *Humbert & Swingle 4836* (P); *Humboldt 70* (P); *Lants s.n.* [16 Mai 1881] (N, P); *Lyall 392* (K, Ld--photo, N--photo),

394 (K, Ld--photo, N, N--photo); *Richard s.n.* [Madagascar] (P); *Perrier 10184* (P), *12596* (P), *16435* (P); *Scott-Elliott 2122* (K); *Viguiier & Humbert 202* (P). CULTIVATED: Martinique: *Bélanger 195* (Ld--photo, N--photo, P, S--photo).

CLERODENDRUM HIRCINUM f. *DENTATUM* Mold., Amer. Journ. Bot. 38: 325. 1951.

Bibliography: Mold., Amer. Journ. Bot. 38: 325. 1951; Mold., Biol. Abstr. 26: 185. 1952; Mold. in Humbert, Fl. Madag. 174: 149, 247, 248, & 267, fig. 40 (5). 1956; Mold., Résumé 155 & 450. 1959; Mold., Fifth Summ. 1: 260 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 249 & 537. 1980; Mold., Phytologia 58: 186. 1985.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 247, fig. 40 (5). 1956.

This form differs from the typical form of the species in having its leaf-blades quite regularly sinuate-dentate along the margins with mostly irregularly disposed, coarse, apically sharp or rounded, ovate, often lobe-like teeth from the base to the apex or merely above the middle.

The form is based on *Bélanger 111* from somewhere in Madagascar, deposited in the Paris herbarium by way of the Moquin-Tandon, Cosson, and Durand herbaria.

Collectors have encountered this plant in forests, referring to it as a scattered small shrub, 0.5 m. tall, with leaves that "stink", and with white corollas, in flower in November. It is possible that this is merely a juvenile form of the species.

Citations: MADAGASCAR: *Bélanger 111* (E--photo of type, F--photo of type, Ld--photo of type, N--photo of type, P--type); *Chapelier s.n.* [Madagascar] (P); *Forsyth Major 41* (K); *Herb. Mus. Paris s.n.* (N, P); *Schlieben 8068* (Ca--1169869, Mu).

CLERODENDRUM HISPIDUM M. R. Henderson, Gard. Bull. Straits Settl. 7: 118--119, pl. 29 [as "*Clerodendron*"]. 1933; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 90. 1942.

Synonymy: *Clerodendron hispidum* M. R. Henderson, Gard. Bull. Straits Settl. 7: 118. 1933.

Bibliography: M. R. Henderson, Gard. Bull. Straits Settl. 7: 118--119, pl. 29. 1933; A. W. Hill, Ind. Kew. Suppl. 9: 68. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 90 (1942) and ed. 2, 138 & 181. 1949; Mold., Résumé 179 & 450. 1959; Mold., Résumé Suppl. 3: 20. 1962; Mold., Dansk Bot. Arkiv 23: 89. 1963; Mold., Fifth Summ. 1: 295 & 304 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 284, 295, & 537. 1980; Mold., Phytologia 50: 252. 1982.

Illustrations: M. R. Henderson, Gard. Bull. Straits Settl. 7: pl. 29. 1933.

A shrub, about 1--1.5 m. tall; branchlets terete, densely yellow-hispid, finely longitudinally ridged when dry; leaves decussate-opposite; petioles stout, 3--8 cm. long, densely hispid, often longitudinally ridged when dry; leaf-blades chartaceo-membranous, to 24 cm. long and 10 cm. wide, elliptic or oblong or the broadest part occasionally above the middle, apically long-acuminate, marginally

rather irregularly sinuate-dentate or subentire, basally rounded or very shallowly cordate (sometimes attenuate), hispid on both surfaces, brunnescenscent or nigrescent-brunnescenscent above in drying, usually paler beneath; midrib distinct but not prominent above, more densely hispid, prominent beneath; secondaries 7 or 8 pairs, more densely hispid than the lamina, rather indistinct above, prominent and distinct beneath, the basal pair usually arising at a more acute angle with the midrib than the others, the next 3 or 4 pairs usually almost straight and then gently curving along the margin, the uppermost pair issuing from the midrib more obtusely, often almost at right angles, then curving abruptly upwards, the looped intramarginal vein usually indistinct; tertiaries transverse, distinct below, distant, more or less horizontal, the reticulations loose and rather faint; inflorescence terminal, paniculate, thyrsoid, pyramidal, to 25 cm. long, densely yellow-hispid; bracts foliaceous, progressively smaller upwards; inflorescence ramifications 1.5--2.5 cm. apart, about 1.2--2 cm. long; cymes trichotomous, rather densely flowered; peduncles with dense multicellular hairs; pedicels usually 0.5--1.2 cm. long (occasionally shorter), apically thickened, with dense multicellular hairs; bracts and bracteoles long-linear, subulate; calyx campanulate, 10--11 mm. long, deeply lobed, the lobes ovate-lanceolate, 8--9 mm. long, apically acute, externally with very long, stiff, multicellular hairs especially on the venation and margins, ventrally glabrous, 5-veined; corolla-tube cylindric, about 13 mm. long, basally ampliate to about 2.7 mm., apically about 1.6 "mm." wide, externally scabrid-puberulent (except basally), internally shortly and sparsely glandular-hairy, the lobes oblong or sub-ovate, subequal, about 4.5 mm. long and 3 mm. wide, apically rounded, the middle lobe of the lower lip somewhat narrower than the others and apically subacute, ventrally glabrous, dorsally densely hispid-pubescent; filaments exserted, slender, about 13 mm. long, glabrous; anthers ovate, about 1.6 mm. long and 0.6--0.7 mm. wide, apically blunt; style slender, about 2 cm. long, glabrous; stigma bilobed, the lobes slender, about 1 mm. long, subulate, tapering; ovary rounded, externally glabrous, shallowly lobed.

The species is based on *Henderson 25085* from a lowland forest near the limestone hill called Bukit Sagu, Kuantan district, Pahang, Malaya. Henderson (1933) comments that it is probably related to *C. langkawiense* King & Gamble "sed ramis pubescentibus pilis longis, foliis multo latioribus, hispidis, petiolis longioribus, calyce maiore, tubo corollae multo brevior differt". He asserts that the type collection was collected in anthesis in October, the fruit unknown, and the corolla yellow and calyx red-hairy.

Collectors describe this plant as a shrub or undershrub, 1--1.5 m. tall, the branches long and slender, the bark light-brown, the petioles hairy, the leaf-blades dull dark-green and hairy above, hairy on the green venation beneath but otherwise purple, the inflorescence axillary and terminal, paniculate, the cymes 2--5-flowered, the calyx dark reddish-brown or purple, red-hairy, pentamerous, the corolla with the "petals spreading to form a half-moon" [*fide* Congdon], the stamens 4, the filaments white, elongate, curved,

the anthers dark-brown, the style long-exserted, and the stigma bifid.

The corolla is described as "white" on Congdon 139 and Hansen & Smitinand 11955, "cream-color" on Smitinand 3082, and "yellow" on Henderson 25085 and Sinclair 8221.

Collectors have encountered the plant in evergreen hillside forests, at 1--1000 m. altitude, in flower in January, October, and November, and in fruit in November. Smitinand reports it "scattered in evergreen forests" in Thailand, where Congdon found it to be "common in grassy fields". In Malaya Sinclair refers to it as "rare along forest paths".

Citations: THAILAND: Congdon 139 (Ac), 952 (Ac); Hansen & Smitinand 11842 (Cp), 11955 (Cp); K. Larsen 8572 (Ld); Smitinand 3082 (Bk--17404, Ld). MALAYA: Pahang: M. R. Henderson 25085 (Bz--19378--isotype, Ld--photo of isotype, N--fragment of isotype, N--photo of isotype, W--photo of type). Trengganu: Sinclair 8221 (W--2912698).

CLERODENDRUM HIULCUM Mold., Lloydia 13: 205--206. 1950.

Bibliography: Mold., Lloydia 13: 205--206. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 56. 1953; Mold. in Humbert, Fl. Madag. 174: 154, 228--230, & 267, fig. 37 (1 & 2). 1956; Mold., Résumé 155 & 450. 1959; Mold., Fifth Summ. 1: 260 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 249 & 537. 1980; Mold., Phytologia 58: 189. 1985.

A small tree, 3--7 m. tall; trunk diameter 15--20 cm.; branchlets and twigs medium-slender, obtusely tetragonal, compressed at the nodes on the younger parts, often conspicuously lenticellate with close prominent lenticels on the older parts, very densely short-pubescent or puberulent with brownish hairs, much less so or even glabrescent on the older parts in age; nodes often more or less annulate; principal internodes 1--4 cm. long; leaves decussate-opposite, brunnescent in drying; petioles slender, 8--19 mm. long, canaliculate above, densely puberulent throughout; leaf-blades membranous, somewhat lighter beneath, elliptic, 5--8 cm. long, 2--4 cm. wide, apically acute or shortly acuminate, marginally entire, basally acute, lightly puberulent above, densely puberulent beneath; midrib slender, flat or subcanaliculate above, prominent beneath; secondaries slender, 4--8 per side, arcuate-ascending, flat above, prominent beneath; veinlet reticulation usually obscure or indiscernible above, only the largest parts subprominulous beneath; inflorescence mostly terminal or with a few pairs of cymes in the uppermost leaf-axils, loosely many-flowered, about 3 times dichotomous, very densely puberulent or short-pubescent throughout with brownish hairs; peduncles slender, 1--2 cm. long; pedicels very slender, 2--5 mm. long; foliaceous bracts often present in pairs at the base of the inflorescence-branches, mostly 1 cm. long or less; bractlets linear, 2--3 mm. long; calyx campanulate, 8--9 mm. long, 5--6 mm. wide, mostly 10-costate, densely puberulent, brunnescent in drying, its rim 5-lobed, the lobes triangular-ovate, about 3 mm. long, apically attenuate-acute; corolla hypocrateriform, rosy-white, the tube vivid-rose in color, very slender, about 2 cm. long or slightly less, externally very minutely pulverulent above the calyx or sub-

glabrescent, the limb white, about 1 cm. wid; stamens exerted about 1 cm. or slightly more from the corolla-mouth; pistil about equaling the stamens, glabrous; fruiting-calyx and fruit not known.

This species is based on *Decary 5065* from quartzite in a forest at Ifandana, in Farafangana Province, Madagascar, collected on September 8, 1926, and deposited in the Paris herbarium. The vernacular name, "fotsivone", is recorded for it.

A key to help distinguish this species from other Madagascan species of the genus will be found under *C. baronianum* Oliv. in the present series of notes (58: 189).

Citations: MADAGASCAR: *Decary 4897* (N, P), *5065* (E--photo of type, F--photo of type, Ld--photo of type, N--photo of type, P--type).

CLERODENDRUM HOLTZEI F. Muell., Journ. Roy. Soc. N. S. Wales 24: 75 [as "*Clerodendron*"]. 1891; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 90. 1942.

Synonymy: *Clerodendron holtzei* F. Muell., Journ. Roy. Soc. N. S. Wales 24: 75. 1891. *Clerodendron holtzei* Bleeser ex L. S. Sm., Contrib. Queensl. Herb. 6: 20. 1969.

Bibliography: F. Muell., Journ. Roy. Soc. N. S. Wales 24: 75. 1891; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101 (1901) and imp. 2, 101. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 90. 1942; H. N. & A. L. Mold., Pl. Life 2: 65. 1948; Mold., Alph. List Cit. 2: 482 & 557 (1948) and 3: 761. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 152 & 181. 1949; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; Mold., Résumé 148, 208, 264, & 450. 1959; L. S. Sm., Contrib. Queensl. Herb. 6: 20. 1969; Chippendale, Proc. Linn. Soc. N. S. Wales 96: 256. 1971; Mold., Fifth Summ. 1: 247, 345, 446, & 462 (1971) and 2: 866. 1971; T. B. Muir, Muelleria 2: 166. 1972; Mold., Phytol. Mem. 2: 237, 334, & 537. 1980.

This species based on *Holtze 109* from the vicinity of Port Darwin, Northern Territory, Australia, collected between December 1890 and February 1891.

McGregor encountered what has been thought to be this plant growing between massive granite boulders and refers to it as a tree, 40 feet tall, the trunk 8 inches in diameter at breast height. It seems obvious, however, that this material needs further study. It seems most highly unlikely that a northern Australian species would also occur naturally in Zimbabwe or that it would grow as a 40-foot tree there! Mueller's original (1891) description of *C. holtzei* is: "Pendent or prostrate or diffuse, much beset with short spreading hairlets; leaves comparatively small, almost sessile, from cordate to rhomboid-orbicular, above nearly glabrous; peduncles terminal and from the axils of the upper leaves, bearing cymously [*sic*] from three to several flowers; bracteoles narrow, very short; flowers rather small; calyx cleft to near the middle, finally somewhat enlarging, but without succulence, its lobes acute; corolla pure white, outside beset with minute hairlets, its tube nearly doubly as long as the calyx, at the orifice bearing soft hairlets, its lobes from ovate to orbicular, about half as long as the tube; stamens hardly extending beyond the corolla-lobes; anthers ellipsoid-sagittate."

[to be continued]

A TAXONOMIC STUDY OF LILIACEAE SENSU LATO: I- NUMERICAL ANALYSIS

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Introduction

Liliaceae has been the center of many phylogenetic considerations, too much debate and controversy with regard to its delimitation and to the taxonomic status of some of its minor taxa. The disputed delimitation of this family is due to the fact that some taxonomists take different attitudes to "the important" criteria prior to setting up their classification. In Krause's (1930) system of classification the relative position of the ovary was considered distinctive for the family; being superior in Liliaceae and inferior in Amaryllidaceae. In Hutchinson's (1934) system the umbellate inflorescence, irrespective of ovary relative position, was regarded as distinct for Liliaceae. Cronquist (1968) submerged Amaryllidaceae in Liliaceae on the belief that none of these criteria is solely sufficient for the separation of two families. Furthermore, the controversy in the taxonomic status of the minor groups has, in most cases, been relying upon relatively few characters. For instance, Hutchinson (1973) regarded the bracteate taxa of Anguillareae as a separate more advanced tribe, viz Iphigenieae, so that his amended concept of Anguillareae included only the ebracteate taxa. A comparison between some of the widely followed systems is presented by Becker (1973) and Traub (1974).

In numerical taxonomy many characters are used in setting up the classification with no overweighing of some characters before analysis. An approach which may overcome the unavoidable defects of the traditional approaches.

Material and methods:

A cosmopolitan sample of 255 species representing 104 genera from Liliaceae *sensu* Engler (1888) were selected for the purpose of this study. This represents about 7.5% and 52.3% of the total number of species and genera. All Engler's tribes except Calcestasieae and all his subtribes except Asphodeleae-Xeroneminae and Aloineae-Kniphofinae are represented in this sample. All species names have been updated in the Index-Kewensis and its supplements; these are given in Appendix I.

It seems reasonable to employ the simplest and the least time-consuming techniques. The species have been investigated through herbarium specimens recovered, prior to any investigation, by boiling (of only those parts to be examined) in water for 5-10 minutes. Clearing in warm lactic acid proved to be indispensable for recording several characters of foliage and perianth leaves and gynoecea. The pollen preparations have been made according to the method of Franks and Watson (1963). Free-hand sections of stems and peduncles have been studied through semi-

permanent preparations stained in phloroglucinol and conc. Hcl using glycerin jelly as a mountant.

Observations and numerical analysis:

Fifty-four morphological and anatomical characters have been recorded comparatively for all species. In numerical analysis coding is the most critical part; there is always discordancy regarding the fate of most characters to be coded. Therefore, a set of coded characters (see Table 1) was made to cover as much as possible aspects of variations in order to cover any operational or human error or misjudgment. However, some criteria are so difficult to define into appropriate states. These are left out of the computational analysis together with those characters in which the literature was consulted to fill the gaps resulting from lack of some parts (e.g. the fruit) from the herbarium specimens. These characters are given in Table 2. The coded data were analysed by an agglomerative polythetic based on the most frequently used clustering strategy known as the unweighted pair groups method using arithmetic averages (UPGMA).

Results and the proposed arrangement:

The result of this analysis is given in the form of a dendrogram in the computer print out to the species level (agglomerative analysis). From which the hierarchical arrangement of the examined 255 species are drawn only to the 25 groups level. It seems reasonable to interpret the hierarchy at 3 different similarity levels. At 0.162 the taxonomic groups are termed GROUPS, those at 0.655 are Groups, while those at 0.713 are groups.

It is of vital importance that computed results should be scrutinized for any obvious errors or misclassification (in terms of the original recorded characters). Hence, a few realignments have been made, incorporating the shift of 11 species. These realignments reduced the number of Groups to 8 and the number of groups to 23.

The hierarchy of the proposed arrangement to that 25 groups level (after realignments) is given in Diagram 1. The distribution of species in each group is given in Appendix I.

Taxonomic evaluation of the srrangement:

1. Internal evidence:

At all levels the groups in the present arrangement of Liliaceae *sensu lato* in Appendix I and Diagram 1 are based on character correlations as seen in Table 1. In this table the distribution of each character subjected to computation among the 'groups' of the proposed arrangement

is given. The data matrix showing the recorded characters of individual species can be obtained on request. The value of presenting this table lies mainly in its relative compactness (and hence the ease of inspection and comparison between groups), and its consistency in showing the distribution of all characters in different groups. From this table, combination of characters on which the "groups" at the 4 GROUPs level and at the 9 Groups level can be easily picked out.

GROUP I includes the examined 8 species of tribe Veratreae. Members of this GROUP are characterized by the presence of raphides in leaves (12); the multinerved tepals (VII, 2) hairy tepals (19); globoid anthers (30); and distinct styles (24).

GROUP II, unlike any other GROUP includes most species which are devoid of raphides. It includes the 17 examined species of Engler's Lilioideae-Tulipeae, 30/38 species Allioideae plus 16/36 species of Melanthioideae. Within this GROUP, the presence of umbellate inflorescence (1,2), globoid anthers (30), lobed stigma (26), hairy tepals (19), uninerved tepals (VII, 1) and distinct subsidiary cells (11) distinguish Group II-D from Group II-B.

Most species of GROUP III are characterized by the frequent occurrence of raphides: in their leaves (12), tepals (18), ovaries (22) and in style (25). GROUP III combines Group III-E which consists mainly of Aloineae together with Group III-E. The latter binds most of the examined species of Asphodeloideae and all species of Dracaenoideae, Ophiopogonoideae and Aletroideae together with Lilioidae-Scilleae.

In GROUP III, the hairy tepals and ovaries, the paniculate and the umbellate inflorescences, and the distinct styles are restricted to members of Group III-F. This latter Group can be further distinguished from Group III-E (Aloineae-Aloinae) on the basis of many characters (e.g. 6, 28, 29, 30 and III, 3). In other words this analysis emphasizes the distinction between Asphodeloideae-Aloineae-Aloinae (Group III-E) and other tribes of Asphodeloideae in Group III-F.

GROUP IV includes, among others, the studied species of Herrerioidae, Luzuriagoideae, Smilacoideae and most Asparagoideae. From Table 1 the axillary position of the flowers seems to be the distinguishing feature of the GROUP. This GROUP is subdivided to accommodate 4/4 species of Asparagoideae-Pariideae and 10/12 species of Melanthioideae-Uvulariae in Group IV-G; 3/3 species of Herrerioidae-Herrerieae, 8/8 species of Smilacoideae and 5/13 Asparagoideae-Polygonateae among others in Group IV-H; while all Asparagoideae-Asparageae (16/16 species), the examined species of Asparagoideae-Convallarieae-Convallarinae with 5/13 species of Asparagoideae-Polygonateae are in Group IV-I. The acceptance of these Groups hits across Engler's Asparagoideae. However, the tribes Asparageae and Pariideae withstand the disruption at this level of the arrangement, while Polygonateae is seriously disrupted.

Table 1. Distribution of the characters subjected to computation among the nine Groups of the proposed arrangement set out in Appendix I and Diagram I. Complete absence of a character in Group is indicated by '-'.

Computed characters	GROUPS Groups total no. of spp.	I			II		III			IV		
		A	B	D	E	F	G	H		I		
		8	10	59	9	108	16	22		23		
1 Flowers or inflorescence axillary		-	-	1	-	-	16	20		18		
2 Flowers bisexual		8	10	57	7	106	16	16		19		
3 Peduncles carry foliage leaves		-	3	20	-	6	-	1		-		
4 Leaves on a long stem		6	-	2	3	4	15	22		23		
5 Cladode or phylloclade present		-	-	-	-	-	-	1		16		
6 Cuticle on stem thin		7	8	22	1	57	13	6		14		
7 Stomata levelled with stem epidermal cells		7	10	48	9	103	14	17		23		
8 Vascular bundles in stem cross section scattered		2	7	19	4	60	13	22		18		
9 Stem with cortical fibrous ring		7	-	33	8	79	14	21		22		
10 Chlorenchyma in stem cross section present		7	6	48	6	90	11	19		15		
11 Subsidiary cells distinguished from epidermal cells		-	-	22	8	42	-	3		7		
12 Raphides detected in leaves		7	4	3	8	96	4	23		20		
13 Tepals similar in size and shape		1	3	19	5	20	2	5		10		
14 Tepals united		3	8	4	7	52	1	7		1		
15 Union extends the whole length of tepals		-	7	2	3	19	1	1		1		
16 Papillae present on tepals		2	3	16	2	77	9	19		2		
17 Papillae only on apical parts of tepals		-	2	11	2	70	4	14		2		
18 Raphides detected in tepals		6	1	1	8	101	4	21		20		
19 Tepals hairy		7	-	11	-	27	7	11		1		
20 Ovary hair		3	-	-	-	5	-	-		-		
21 Ovary surface papillated		1	1	7	2	18	1	2		-		
22 Raphides detected in ovary		6	2	1	6	94	2	15		22		
23 Style not deeply inserted in ovary		8	3	45	8	90	16	16		22		

24 Style distinct	7	6	10	-	9	11	-	9
25 Raphides detected in style	4	-	2	6	54	2	5	8
26 Stigma lobed	-	-	18	1	37	6	4	10
27 Staminal filament glabrous	7	8	52	8	102	15	18	19
28 Stamens inserted on perianth	6	9	8	2	52	-	11	15
29 Staminal filament broad	5	4	46	2	71	4	15	18
30 Anthers bloboid	7	-	17	2	24	-	2	9

I Flowers or inflorescence.

State 1, Solitary	-	7	13	-	1	13	4	9
State 2, umbellate	-	-	30	-	9	-	9	1
State 3, corymbose	-	-	-	-	2	-	-	-
State 4, recemose	2	3	16	9	70	3	9	13
State 5, paniculate	6	-	-	-	26	-	-	-

II Leaf arrangement.

State 1, alternate	4	-	9	4	2	11	14	22
State 2, opposite	-	-	5	-	2	-	1	1
State 3, whorled	-	-	3	-	3	5	7	-
State 4, clustered at base of scape or peduncle	4	8	15	4	73	-	-	-

III Leaf nature.

State 1, foliage	8	10	59	2	108	16	22	7
State 2, scaly	-	-	-	-	-	-	-	13
State 3, succulents	-	-	-	7	-	-	-	-
State 4, spiny	-	-	-	-	-	-	-	3

IV Leaf shape.

State 1, tubular	-	1	12	1	7	-	-	-
State 2, linear	3	7	43	6	93	-	7	1
State 3, ovate	5	2	4	2	8	16	12	5
State 4, hastate	-	-	-	-	-	-	3	1

V Leaf surface.

State 1, glabrous	3	10	59	4	100	12	22	7
State 2, warty	-	-	-	2	1	-	-	-
State 3, spiny	-	-	-	3	2	-	-	-
State 4, hairy	5	-	-	-	5	4	-	-

VI Root stock.

State 1, rhizome	5	2	7	6	45	10	10	6
State 2, corm	-	6	3	-	-	-	2	-
State 3, bulb	1	2	47	2	39	-	-	-

VII Venation of tepals.

State 1, uninerved	-	-	27	1	72	-	13	23
State 2, multinerved	8	9	20	8	33	1	9	-
State 3, reticulate	-	1	12	-	3	15	-	-

Within GROUP IV the reticulate venation of the tepals is restricted to members of Group IV-G. The distinction of this Group (mainly Melanthioideae-Uvularieae) can be further substantiated (see Table 1). Characters number 5, 16, 24 and II,3 in Table 1 reflect some aspects of the variations exhibited between members of Group IV-H and Group IV-I. Eustrephus latifolius in Group IV-H possesses leafy stems; a character which otherwise is restricted to members of Group IV-I. However, in the former species the presence of the leafy stems is associated with hairy tepals while in Group IV-I, their presence is associated with glabrous tepals.

External evidence:

A defensible taxonomic scheme must possess a certain peridictive value. Therefore, in addition to the recorded information which was included in the computation, more criteria were recorded for all the species. The distribution of these characters among the Groups is given in Table 2. The record of these features for each species is given in Elwan (1979). Also, all known chromosomal counts for the species under investigation have been compiled from different sources. These are: Darlington and Wylie (1961), Ornduff (1967, 1968), Moore (1973, 1974), Fedorov (1976). Also the IOPB chromosome number reports presented periodically by Askell and Löve in Taxon have been consulted.

From Table 2 it is evident that the proposed arrangement gains additional support. Thus with the exception of some Ophiopogonoideae, Asparagoideae, Dracaena and Dianella in Group III-F, the berry type of fruit is confined in GROUP IV. In GROUP II and GROUP III there is a tendency towards the absence of bundle sheath. However, this tendency is more prominent in GROUP II which comprises 30/38 spp. of Alliioideae and 17/17 spp. of Lilioideae-Tulipeae. In GROUP IV the bundle sheath is present in most species.

At lower reaches of the hierarchy, the distinction between the "groups" is even more sound. Within GROUP II the distinction between members of Group II-B (which comprises Colchiceae and 4 other species) and those of Group II-D (which includes Lilioideae-Tulipeae among others) can be emphasized in terms of many characters (see no. 7, 13 and 15 in Table 2). Also within GROUP III, the distinction between Group III-E (mainly Aloineae-Aloinae) and Group III-F (which includes most of Asphodeloideae, Lilioideae, Scilleae, Dracaenoideae, Ophiopogonoideae and Alteroideae) can be emphasized in terms of characters no. 1, 2, 8, 11, 13 and 17 (see Table 2). Furthermore, within GROUP IV, the distinction between Group H and I at one hand and Group G on the other (see Diagram 1) is quite clear in terms of character no. 10-13 (see Table 2).

One should also point out that some "groups" are seemingly "good" in terms of chromosomes counts. For instance, the chromosome number for most species is frequently in multiple of 7, 8 and 9 in all GROUPS except in GROUP IV, where most species have $x=10$. The latter GROUP includes most of Asparagoideae, Luzuriagoideae, Herrerioidae, Smilacoideae among others. Also the distinction within GROUP II between

Table 2 : Distribution of the characters recorded for 255 species of Liliaceae sensu lato and not subjected to numerical analysis. The complete absence of a character in a group is indicated by '-'.

Characters	GROUPs	I			II		III		IV		
	Groups	A	B	D	E	F	G	H	I		
		8	10	59	9	108	61	22	23		
1 Fruits berries		-	-	-	-	13	4	15	22		
2 Flowers hairy		4	-	1	-	6	1	-	-		
3 Stipules present		-	-	-	-	-	-	6	-		
4 Leaves with spiny apex		-	-	-	4	1	-	1	-		
5 Stem glabrous		-	3	17	7	52	11	17	22		
6 Bundle sheath present		7	2	10	4	49	9	18	20		
7 Stomata on leaves sunken		-	-	16	2	8	1	-	-		
8 Druses in leaves		-	1	3	-	4	2	-	-		
9 Solitary crystals in leaves		-	-	1	-	4	4	2	2		
10 Druses in ovaries		-	-	4	-	2	4	-	-		
11 Solitary crystals in ovaries		1	-	3	-	3	5	-	-		
12 Style papillated		-	-	3	1	7	5	-	-		
13 Style very short		6	-	13	-	11	-	6	14		
14 Style long		-	8	18	4	42	10	7	2		
15 Pollen grains smooth		1	-	17	1	10	1	3	7		
16 Pollen grains granulose		1	10	38	7	79	9	16	11		
17 Pollen grains reticulate		6	-	4	-	19	5	3	1		

Group II-B and Group II-D is meaningful in terms of chromosome counts. Thus, while members of the former Group (Colchiceae among others) have chromosomes predominantly in multiples of 9 or 17, those of the latter (Lilioideae-Tulipeae among others) have chromosomes mostly in multiples of 8. Similarly within GROUP III, the multiples of 8 chromosome counts are strictly confined to members of Group III-F, while those of Group III-E have chromosomes mainly in multiples of 7. Within GROUP IV, there is an apparent tendency in Group IV-G for the chromosomes to be in multiples of 7, 10, 11 and 13; while in Group IV-H the chromosomes are mainly in multiples of 8, 9 and 10.

Conclusion

From Tables (1 & 2), it is clear that some of the proposed groupings are "better" than others (viz based on manifest correlations among characters). The correlation reflected among members of GROUP IV is so evident, however, GROUP III reflects slight correlations between characters but this may be merely due to its large size. However, at lower reaches of the hierarchy, some groups are well defined. The recognized taxa, other than genera which appear intact in the present analysis at 25 groups level (and consequently at higher levels) are; Veratreae (Engler, Hutchinson) in group 1., Colchiceae (Engler, Hutchinson) in group 4, Tulipeae (Hutchinson, Engler, Melchoir, 1964) in group 7; Hutchinson's Aloineae = Melchoir's Aloeae in group 11, Aletroideae (Engler, Melchoir) in group 18, Engler's Pariideae = Hutchinson's Trilliaceae in group 19, Herrerieae (Hutchinson, Melchoir) in group 22.

At nine Groups level the taxa which appear intact are: Anguillaridae (Hutchinson, Engler) in Group D; Gilliesiae (Engler, Melchior) in Group D; Asphodelae-Anthericinae (Engler) in Group F; Asphodelae-Eriosperminae (Engler, Melchior) in Group F; Engler's Asphodeloideae-Hemerocalloideae = Melchior's Hemerocalleae in Group F; Ophiopogonoideae (Engler, Melchior) in Group F.

At four GROUPs level the taxa which appear intact are: Melchior's Simlacoideae = Hutchinson's Smilacaceae, Engler's Luzuriagoideae = Hutchinson's Philesiaceae, Asparageae (Engler, Melchior) in GROUP IV; and Dracaenoideae (Engler) in GROUP III.

Some of the represented groups are seemingly homogenous in terms of well recognized taxa; thus group 1 includes Verateae; group 2 includes only Scilleae p.p.; group 3 includes only Colchiceae; group 6 includes only Anguillaridae; group 11 includes only Aloineae-Aloinae; group 13 only Dracaenae p.p.; while Asparageae sensu Melchior is in Group IV-I.

The taxa which seem to suffer most disruption and which fail to appear in only one of the 4 main GROUPs are Scilleae, Asphodelae, Holonieae, Tofieldiae, Johnsoniae, Polygonateae and Lomandreae.

However, the disruption of some of these taxa may be attributed to i) Deficiency on behalf of the machinery, ii) Any human error incorporated in the analysis iii) The sample under investigation represents quite a heterogenous taxon (Liliaceae sensu lato) so that the recorded characters could not reflect the actual relationships among all of its groupings. However, it is hoped that the present study might contribute to similar studies in the taxonomy of liliaceous taxa. It also may direct the attention towards the appropriate characters necessary for monographic studies concerning particular taxa.

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Appendix I: The distribution of 255 species of Liliaceae sensu lato among the 25 groups of GROUPs I-IV in diagram I.

GROUP I

Group A

Group 1:

Veratrum grandiflorum Maxim., *V. eschscholtzia* Gray, *V. californicum* Durand., *V. stamineum* Maxim., *V. album* Linn., *Zygadenus paniculatus* S. Wats., *Z. mattalii* A. Gray, *Melanthium virginicum* Linn.

GROUP II

Group B

Group 2:

Hyacinthus orientalis Linn., *Muscari paradoxum* C. Koch

Group 3:

Heloniopsis breviscapa var. *albiflora* Maxim.,
H. orientalis Thunb.

Group 4:

Colchicum arenarium Waldst. et Kit., *C. autumnale* Linn., *C. cornigerum* Linn., *C. luteum* Baker, *C. montanum* Linn., *Merendera robusta* Bunge

Group D

Group 6:

Dipidax ciliata Baker, *D. rosea* Laws.

Group 7:

Calochortus splendens Dougl. ex Benth., *C. uniflorus* Hook. et Arn., *Erythronium dens-canis* Linn., *Fritillaria arianum* Losinks. et Vved., *F. atropurpurea* Nutt., *F. liliacea* Lindl., *F. meleagris* Linn., *F. roylei* Hook., *F. tenella* Bieb., *Gagea bracteolaris* Salisb., *G. dshungarica* Regel, *G. fascicularis* Salisb., *G. fibrosa* Schult., *G. mauritanica* Schult., *G. liotardi* Schult., *G. minima* Ker-Gawl., *G. persica* Boiss., *Gilliesia graminea* Lindl., *G. monophylla* Reiche, *Lilium maritimum* Kellogg, *L. martagon* Linn., *Lloydia alpina* Salisb., *Miersia chilensis* Lindl., *Tulipa cretica* Boiss. et Heldr., *T. greigi* Regel, *T. oculus-solis* Saint-Amans, *T. stellata* Hook., *T. sylvestris* Linn.

Group 8:

Allium ampeloprasum Linn., *A. artemisiatorum* Eig et Feinbr., *A. aschersonianum* Barbey, *A. barthianum* Aschers. et Schweinf., *A. blomfieldianum* Aschers. et Schweinf., *A. carinatum* L., *A. cepa* Linn., *A. curtum* Bioss. et Gillard, *A. desertorum* Forsk., *A. erdelii* Zucc., *A. monophyllum* Vved., *A. flavum* Linn., *A. narcissiflorum* Vill., *A. paniculatum* Linn., *A. roseum* Linn., *Androcymbium gramineum* Macbride, *Asphodelus acaulis* Desf., *Eremurus kopatdagensis* Hort. ex Karrer, *Nothoscordum bivalve* (L.) Britt., *N. fragr Kunth*, *N. texanum* M.E. Jones, *Sowerbaea juncea* Linn., *Tulbaghia alliacea* var. *ludwigiana* Linn.

Group 9:

Alania cunninghami Steud., *Anguillaria dioice* R. Br., *Baeometra columel-*

laris Salisb., *Chinographis japonica* Maxim., *Tofieldia calyculata* Wahlenb., *T. palustris* Huds.

GROUP III

Group E

Group 10:

Dipcadi erythraeum Webb et Berth., *Muscari neglectum* Guss. ex Tenoro.

Group 11:

Aloe metrifomis Mill., *A. spinosissima* Hort. ex Jahandiez, *A. vera* Linn., *Gasteria maculata* Haw., *Haworthia fasciata* Haw., *H. margaritifera* Haw., *H. reticulata* Haw.

Group F

Group 12:

Nolina lindheimeriana S. Wats., *Odontostomum hartwegii* Torr.

Group 13:

Astelia alpina R. Br., *A. argyrocoma* A. Hell.

Group 15:

Anthericum ramosum Linn., *Asphodelus microcarpus* Viviani, *Chlorogalum angustifolium* Kellogg, *Chlorophytum elatum* R. Br., *Dianella revoluta* R. Br., *Hemerocallis aurantiaca* Baker, *H. fulva* Linn., *Thysanotus dichotomus* R. Br.

Group 16:

Dracaena afromontana Mildbread, *Massonia angustifolia* Linn.

Group 17:

Albuca major Linn., *A. minor* Linn., *Anthericum angustifolium* Hochst., *A. capitatum* Vill., *A. fasciculatum* Baker, *Asphodelus albus* Willd., *A. fistulosus* v. *tenuifolius* L., *A. pendulinus* Coss. et Dur., *A. ramosus* Linn., *A. tenuifolius* Gav., *Bulbino asphodeloides* Spreng., *Bulbinella caudata* Kunth, *B. gracilis* Kunth., *Camassia cusickii* S. Wats., *Chlorophytum amplexicaule* Baker, *C. bakeri* Poella., *C. norlindhii* Bak., *Clintonia alpina* Kunth., *C. borealis* Rafin., *Dasyllirion acrostichum* Zucc., *Dipicadi serotinum* Medic., *D. unifolium* Baker, *Echeandia brevifolia* Wats., *Eremurus himalaicus* Baker, *E. spectabilis* Bieb., *Eriospermum abyssinicum* Baker, *E. bakerianum* Schinz., *E. burchellii* Baker, *Eucomis punctata* L. Herit., *Hyacinthus amethystinus* Linn., *Liriope muscari* v. *variegata* L. H. Bailey., *L. spicata* Lour., *Lomandra ettrisa* (R.Br.) J. Britten, *Milla biflora* Cav., *Mulla maritima* S. Wats., *Narthecium ossifragum* (L.) Huds., *Nolina longifolia* (Karra) Hemsl., *Ophiopogon formosanus* Ohwi, *Ornithogalum brachystachys* Hort. Gorenk ex Schult., *O. comosum* Linn., *O. narbonense* Linn., *O. tenuifolium* Guss., *Peliosanthes neilgherriensis* Wight., *Scilla autumnalis* Linn., *S. bifolia* Linn., *S. yemensis* Deflers, *Sowerbaea laxiflora* Lindl., *Urginea grandiflora* Baker, *U. scilla* Steinh., *Xerophyllum asphodeloides* (L.) Nutt., *Yucca aloifolia* Linn., *Y. filamentosa* Linn.

Group 18:

Agapanthus africanus Leighton, *A. campanulatus* (L.) Hoffm., *A. umbellatus* L'Herit, *Alettris aurea* Walt., *A. bracteata* Northrop, *A. farinosa* Linn., *A. spicata* Thunb., *Anthericum jacquinianum* Schult., *Aphyllanthes monspeliensis* Linn., *Bloomeria crocea* (Torr.) Cav., *Brodiaea congesta* Sm., *B. laxa* S. Wats., *Chionodoxa luciliae* Boiss., *Cordyline stricta* Endl., *C. terminalis* Kunth., *Dracaena elliptica* Thunb., *D. fragrans* Ker-Gawl., *Drimys hyacinthoides* Baker, *D. media* Jacq., *Hosta albomarginata* (Hook.) Ohwi., *H. longissima* Honda, *Hyacinthus alexandrina* Feinbr., *H. flexuosus* Baker, *H. macrobotrys* Baker, *H. mauritanica* Pomel., *H. sessiliflorus* (Viv.) Kth., *Lachenalia algoensis* Schone., *L. comptonii* Baker, *L. tricolor* Jacq., *Muscari bicolor* (Boiss.) Eig. et Feinbr., *M. comosum* (L.) Mill., *M. eburnea* Eig. et Feinbr., *M. maritimum* Desf., *M. moschatum* Willd., *M. holzmanni* Hirc., *M. racemosum* Mill. Gard., *Rohdea japonica* Rolh., *Sansevieria cylindrica* Boj., *S. trifasciata* Hort. ex Prain., *Scilla festalis* Salisb., *S. peruviana* Linn., *Urginea undulata* Steinh.

GROUP IV**Group B****Group 19:**

Gloriosa rothschildiana O'Brien., *G. simplex* Linn., *Medeola virginiana* Linn., *Paris quadrifolia* Linn., *Philesia magellanica* J.F. Gmel., *Tricyrtis affinis* var. *affinis* Makin., *T. formosana* Baker, *T. hirta* var. *parviflora* Hooker, *T. latifolia* Maxim., *Trillium cernuum* Linn., *T. govanianum* Wall., *Uvularia grandiflora* Sm., *U. perfoliata* Linn., *U. pudica* (Walter.) Fernald, *U. sessilifolia* Linn.

Group 20:

Disporum trachycarpa Benth. et Hook.

Group H**Group 21:**

Heterosmilax japonica Kunth., *Polygonatum latifolium* Desf., *P. multiflorum* (L.) All., *P. odoratum* (Mill.) Druce., *P. officinale* All., *P. verticillatum* All., *Smilax aspera* Linn., *S. beyrichii* Kunth, *S. herbacea* Linn., *S. laurifolia* Linn., *S. californica* A. Gray.

Group 22:

Behnia reticulata F. Didrichs., *Eustrephus latifolius* R. Br., *Geitonoplesum cymosum* A. Cunn., *Herreria latifolia* Woodes., *H. montevidensis* Klotzsch, *H. stellata* Ruiz et Pav., *Rhipogonum album* R. Br., *R. scandens* Forst

Group 23:

Dasypogon bromeliifolius R. Br., *Wallaria mackerjii* J. Kirk., *W. nutans* J. Kirk.

Group I**Group 24:**

Asparagus acutifolius Linn., *A. africanus* Lam., *A. maritimus* Pall., *A. medeoloides* Thunb., *A. officinalis* Linn., *A. plumosus* Baker, *A. sprengeri* Regel, *A. stipularis* Forsk., *A. trichophyllus* Bunge., *A. turkest-*

Group 24: (Cont.)

anicus Popov., *Danae gayae* Webb. et Kunth., *Ruscus aculeatus* Linn.,
R. hyphyllum Linn., *R. ponticus* Woronow et Schelkownikow.

Group 25:

Acanthocarpus preissii Lehm., *Asparagus falcatus* Linn., *A. racemosus*
 Willd., *Convallaria majalis* Linn., *Maianthemum convallaria* (Weber)
 Wigg., *Smilacina racemosa* (L.) Desf., *S. stellata* (L.) Desf., *S. sessilifolia*
 Nutt. ex Baker, *Streptopus strptopoides* var. *japonicus* Fassstt.

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A TAXONOMIC STUDY OF LILIACEAE SENSU LATO:

II. EVALUATION OF ENGLER'S SUBFAMILIES

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Introduction

In our previous paper (Badawi & Elwan, 1986) a taxonomic arrangement of 255 species representing 104 genera of the Liliaceae sensu Engler (1888) has been proposed. Several taxonomic treatments of the Liliaceae are already on record (Lindely, 1853; Bentham & Hooker, 1862-1883; Krause, 1930; Lawrence, 1951; Melchoir, 1964; Dahlgren, 1976; Cronquist, 1968; Thorne, 1968; Hutchinson, 1973; and Takhtajan, 1980). Hardly any two of these classifications are in full or near full agreement, and the discrepancies between them go as far as splitting the family into several splinter families. Furthermore, what might be regarded as a tribe by one author is raised to family by another or reduced into a subtribe by a third. Therefore, it is imperative to test our proposed arrangement against other systems. That of Engler (1888), being the most comprehensive and detailed account of the family has been chosen for this purpose.

In comparing classificatory systems, hierarchical levels of the groups (or taxa) to be compared have to be pre-determined. In this study we have endeavoured to select levels which would lead to maximum resemblance between these taxa in our scheme and those in Engler's system.

COMPARISON WITH THE ENGLEREAN SYSTEM

The tabulated sort of comparison between our arrangement (Badawi & Elwan, 1986) and that of Engler (1888) seems most profitable. Two tables have been, therefore, constructed. Table 1 is made at the 4 GROUPS level of our arrangement, while Table 2 is made at the 9 Groups level.

It is evident from Table 1 that 5 out of the 11 subfamilies of Engler's Liliaceae are disrupted at the 4 GROUPS level. Melanthioideae is the most disrupted; it is shared by the four GROUPS and the distribution of its species among these GROUPS shows no concentration in any one GROUP. These disrupted 5 subfamilies are the largest of the family Liliaceae. The other 6 subfamilies are with relatively limited concepts; and these were, therefore, represented by relatively few species in the sample examined to propose our arrangement.

I. Subfamily Melanthioideae:

At the 4 GROUPS level, Veratreae, Anguillarieae, Colchiceae and Uvularieae are homogenous, i.e. appearing in only one of the GROUPS. The former is the only constituent of GROUP I, the latter is in GROUP IV, while the other two tribes are in GROUP II. From these tribes only

Uvularieae become disrupted at the 9 Groups level. Tofieldieae and Helonieae are disrupted at the 4 GROUPs level (Table 2). However, one should point out that the general arrangement of the examined Melanthioideae may be considered as a support to Buxbaum's (1937) Wurmbaeoideae. This subfamily is made to include the tuberous Melanthioideae of Engler viz Anguillarieae, Colchiceae and Uvularieae p.p. (Gloriosa, Littonia and Sandersonia). The first two tribes are in GROUP II; but Gloriosa is in GROUP IV with the examined species of Tricyrtis, Uvularia (Engler's Uvularieae). In other words all the examined Wurmbaeoideae except Gloriosa are in GROUP II (see Badawi & Elwan, 1986). Hegnauer (1963) and Wildman & Pursey (1968) gave chemical supports for the recognition of Wurmbaeoideae. Huber (1969) relied on seed anatomy, had also supported the relationship among the tribes of this subfamily.

Buxbaum's (1937) Colchiceae includes Androcymbium and Colchicum. In our arrangement the former genus is grouped with Anguillarieae in Group II-D; while Colchicum is in Group II-B. In other words, our arrangement coincide with Engler's concept of Colchiceae not to include Androcymbium. Also, Merendera in our arrangement is more related to Colchicum rather than to Dipidax, Androcymbium and Baeometra. Baker (1880) included the last three genera with Merendera (tribe Merendereae). Colchicum is sometimes defined to include Merendera; together with Bulbocodium (Stefanoff, 1926).

The examined 12 species of Engler's Uvularieae (i.e. including Tricyrtis, which is Tricyrtideae by Hutchinson, 1973) are in GROUP IV. Therefore, our arrangement did not emphasize the distinction of Tricyrtis from other Uvularieae. However, Sen (1975) stated that the chromosome number as well as the Karyotype of Tricyrtis indicate that its taxonomic assignment into an advanced tribe Tricyrtideae is justified. Also Cheadle & Kosakai (1971), depending on the type of vessels in stems and roots, emphasized the difference between Tricyrtideae (including Tricyrtis and Sandersonia) and Uvularieae.

The taxonomic affinity of Walleria had received a wide controversy, thus Bentham (1880), Engler (1888), Baker (1897) included this genus in Uvularieae. Hutchinson (1959 & 1973) considered Walleria in Uvularieae, in Dianelleae as well as in Techophilaeaceae. Chaedle & Kosakai (1971) suggested, on anatomical bases, that Walleria should be excluded from Dianelleae, while it could be placed in Uvularieae or Techophilaeaceae. Huber (1969) considered this genus a member of the tuberous Aspara-goideae. It was not expected in our morphological and anatomical study of Liliaceae sensu lato to solve such taxonomic conflict of Walleria. However, the results of our investigation emphasized the distinction of Walleria from Uvularieae. At the 9 Groups level of our arrangement the two examined species of Walleria are separated from the other 10 species of Uvularieae (Appendix I in Badawi & Elwan, 1986).

Table 1. A comparison between Engler's subfamilies of Liliaceae and GROUPs I-IV of our proposed arrangement (Badawi & Elwan, 1986) in terms of the number of species representing each subfamily in each of the 4 GROUPs; number between parentheses equal total number of species within groups; '*' indicates the disrupted subfamilies.

Engler's subfamilies	GROUPs of the proposed scheme			
	I(8)	II(69)	III (117)	IV (61)
I. Melanthioideae*	8	16	2	12
II. Herrerioideae	-	-	-	3
III. Asphodeloideae*	-	4	42	2
IV. Allioideae*	-	30	8	-
V. Lilioideae*	-	19	40	-
VI. Dracaenoideae	-	-	12	-
VII. Asparagoideae*	-	-	3	32
VIII. Ophiopogonoideae	-	-	6	-
IX. Aletrioidae	-	-	4	-
X. Luzuriagoideae	-	-	-	4
XI. Smilacoideae	-	-	-	8

II. Subfamily Asphodeloideae:

This subfamily is disrupted at the 4 GROUPs level of our arrangement. However, 42 out of the examined 48 species are in GROUP III (see Table 1). Only two Asphodeloid species are in GROUP II; these are of Lomandreae and Dasypogoneae. These tribes are commonly regarded to be Xanthorrhoeaceae rather than Liliaceae (Hutchinson, 1973; and Dalhgren, 1976). No doubt that this grouping of 42 species of Engler's Asphodeloideae in GROUP III out of the examined 48 species avouch the relative homogeneity of this subfamily. Nevertheless, at the 9 Groups level, our arrangement raise a taxonomic point of interest considering the status of Aloineae. Members of this group did spilt off from other Asphodeloideae (Table 2). Engler's subtribes of Aloineae, viz Aloineae-Aloinea and Aloineae-Kniphofinae have been raised to tribal rank by many taxonomists (Hutchinson, 1973 and Takhtajan 1980). While Nakai (1942) gave the tribe Aloineae (in its strict sense) the family status "Aloeaceae". And in fact the divergence of Aloineae-Aloinea, in our arrangement from the other examined members of Asphodeloideae, is at a high level of dissimilarity (Badawi & Elwan, 1986). Therefore, our arrangement evokes the acceptance of the family Aloeaceae. Sen (1975) had also pointed out that members of this group have a characteristic karyotype. All having $X=7$; with 4 very long and 3 very short chromosomes.

III. Subfamily Allioideae:

Many genera of this subfamily are considered in more recent taxonomic treatments (e.g. Traub, 1963; and Hutchinson, 1973) not liliaceous taxa. In our arrangement only 8 species of Allioideae are in GROUP III. These represent the examined species of Agapanthes, Brodieae, Blo-omeria, Milla and Miulla (see Badawi & Elwan, 1986). These genera are

Amoryllidaceae in Hutchinson's (1973) system. The relationship of these genera to Amoryllidaceae was ascertained and proved to be based on a number of morphological and anatomical criteria (Badawi & Elwan, 1976).

However, the main bulk of the examined Allioideae (30 out of 38 species) are in GROUP II. These are Tulbaghia (1 species), Allium (15 species), Nothoscordum (3 species), Gagea (8 species), Gilliesia (2 species) and Miesera (1 species). These genera, with the exception of Gagea are in many treatments outside the framework of Liliaceae, but rather in a much definable family Alliaceae (Dahlgren, 1967; and Takhtajan, 1980). In Hutchinson's (1973) system these genera are Amoryllidaceae, while Gagea is Tulipeae. In our arrangement, GROUP II includes also the examined 17 species of Tulipeae (Table 2). This means that members of Allioideae in GROUP II share a relatively high similarity to Tulipeae rather than to the 8 species of Allioideae in GROUP III. The taxonomic attitude to consider Gagea as Tulipeae was ascertained on embryological and cytological bases (Kaul et al., 1969; and Sen, 1975). Also on morphological and anatomical bases (Badawi & Elwan, 1976) suggested that Gagea together with Tulbaghia and Gilliesia are better associated with Tulipeae.

IV. Subfamily Lilioideae:

The disruption of this subfamily hits across its two tribes; Tulipeae (17/17 species) is in GROUP II, while Scilleae (40/42 species) is in GROUP III. Thus our arrangement reflects a pronounced distinction between Engler's Tulipeae and Scilleae making the concept of this subfamily rather implausible. The recognition of Tulipeae (including Gagea) and Scilleae as two separate but highly related groups is not debated any more. However, Sen (1975) suggested the exclusion of Colchortus, Llyodia and Gagea from Hutchinson's Tulipeae. He also visualized the fact that Scilleae contains several assemblages but their relationship is not very remote.

V. Subfamily Asparagoideae:

The disruption of this subfamily at the 4 GROUPs level of our arrangement does not reflect serious taxonomic conflict. Since 32 out of the examined 35 species of Asparagoideae are in GROUP IV, while only 2 species of Clintonia (Polygonateae) and one species of Rhodea (Convolvulariaceae) are in GROUP III (Badawi & Elwan, 1986). However, at the 9 Groups level only Pariideae and Asparageae appear intact, while Polygonateae is seriously disrupted (Table 2). The latter tribe was divided by Sen (1975) on cytological bases into 3 tribes. Clintonia and Streptopus in one tribe, while Polygonatum, Maianthemum and Smilacina in other tribe and Disporum in the most primitive tribe. Our arrangement (Badawi & Elwan, 1986) shows that Clintonia is in GROUP III, while the other 11 examined species of Polygonateae (Streptopus, Polygonatum, Maianthemum and Smilacina) are in GROUP IV. In other words, our arrangement indicates the distinction of only Clintonia from Polygonateae.

Engler's Convollarieae is divided into two subtribes, viz Convollarieae-Aspidistreae and Convollarieae-Convollarineae. These two groups gained the tribal status (Hutchinson, 1973). The distinction between these two tribes was substantiated, on anatomical bases, by Cheadle & Kosakai (1971). Sen (1975) had also accepted these two tribes, he pointed out to the resemblance between Convollarieae (sensu stricto) and Polygonateae. This affinity was suggested by Therman (1956). In our arrangement Convollarieae-Convollarineae is separated from Convollarieae-Aspidistreae, in GROUP IV and GROUP III respectively. Our results also substantiate Sen's (1975) idea about the close relationship of Polygonateae and Convollarieae. GROUP IV includes Polygonateae (except Clintonia) and Convollarieae (sensu stricto).

Engler's Asparageae includes Asparagus, Ruscus and Danea. The relationship of these genera raised serious taxonomic debates. Hutchinson (1973) retained this tribe to include only Asparagus, while the other two genera are Ruscaceae. Takhtajan (1969) and Dahlgren (1976) had suggested the family status for Asparagus. However, Sen (1975) stated that there is no cogent cytological evidence for that status. Also El-Gazzar & Badawi (1975) did not warrant enough distinction to erect separate family for Asparagus. In our arrangement these 3 genera are grouped together even to the 25 groups level (Badawi & Elwan, 1986). Such grouping, nevertheless, may be due to their pronounced distinction from other liliaceous taxa rather than their similarity.

The tribe Pariideae in Engler's (1888) system is Medeoleae by Bentham and Hooker; including Medeola, Scoliopus, Paris and Trillium. Takhtajan (1969) and Cronquist (1968) kept also this tribe in Liliaceae. A distinct family, Trilliaceae was erected for these genera (Hutchinson, 1973). However, in our arrangement Pariideae seems to fit in quite well with other Asparagoideae in Group IV. Chatterji & Sharma (1970) had also on cytological bases suspected the recognition of a distinct family for such group of genera.

Table 2. Comparison between our arrangement (Badawi & Elwan, 1986) and that of Engler at the nine Groups level. Numbers between parentheses represent the number of species out of the total examined.

GROUP I (8/255)

Group A:

Melanthioideae-Veratreae (8/8)

GROUP II (69/255)

Group B:

Melanthioideae-Helonieae (2/4)

Melanthioideae-Colchiceae (6/6)

Lilioideae-Scilleae (2/42)

Group D:

Melanthioideae-Tofieldieae	(2/3)
Melanthioideae-Helonieae	(1/4)
Melanthioideae-Anguillarieae	(5/5)
Asphodeloideae-Asphodeleae-Asphodelinae	(2/10)
Asphodeloideae-Johnsonieae	(2/3)
Allioideae-Agapantheae	(1/4)
Allioideae-Allieae	(26/31)
Allioideae-Gilliesieae	(3/3)
Lilioideae-Tulipeae	(17/17)

GROUP III (117/255)**Group E:**

Asphodeloideae-Aloineae-Aloinae	(7/7)
Lilioideae-Scilleae	(2/42)

Group F:

Melanthioideae-Tofieldieae	(1/3)
Melanthioideae-Helonieae	(1/4)
Asphodeloideae-Asphodeleae-Asphodelinae	(8/10)
Asphodeloideae-Asphodeleae-Anthericinae	(14/14)
Asphodeloideae-Asphodeleae-Chlorogalinae	(1/1)
Asphodeloideae-Asphodeleae-Odontostominae	(1/1)
Asphodeloideae-Asphodeleae-Eriosperminae	(3/3)
Asphodeloideae-Asphodeleae-Dianellae	(1/1)
Asphodeloideae-Hemerocallideae	(4/4)
Asphodeloideae-Aphyllantheae	(1/1)
Asphodeloideae-Johnsonieae	(1/3)
Asphodeloideae-Lomandreae	(1/2)
Allioideae-Agapantheae	(3/4)
Allioideae-Allieae	(5/31)
Lilioideae-Scilleae	(38/42)
Dracaenoideae-Yuccaeae	(2/2)
Dracaenoideae-Nolineae	(3/3)
Dracaenoideae-Dracaeneae	(7/7)
Asparagoideae-Polygonateae	(2/13)
Asparagoideae-Convollarieae-Aspidistrinae	(1/1)
Ophiopogonoideae	(6/6)
Aletroideae	(4/4)

GROUP IV (61/255)**Group G:**

Melanthioideae-Uvularieae	(10/12)
Asparagoideae-Polygonateae	(1/13)
Asparagoideae-Pariideae	(4/4)
Luzuriagoideae	(1/4)

Group H:

Melanthioideae-Uvularieae	(2/12)
Herrerioideae-Herrerieae	(3/3)
Asphodeloideae-Dasypogoneae	(1/1)
Asparagoideae-Polygonateae	(5/13)
Luzuriagoideae	(3/4)
Smilacoideae	(8/8)

Group I:

Asphodeloideae-Lomandreae	(1/2)
Asparagoideae-Asparageae	(16/16)
Asparagoideae-Polygonateae	(5/13)
Asparagoideae-Convollarieae-Convollarinae	(1/1)

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BOOK REVIEWS

Alma L. Moldenke

"THE DARWINIAN HERITAGE" edited by David Kohn, xii & 1138 pp., 22 b/w fig. incl. 5 photo. & 5 tab. Princeton University Press, Princeton, New Jersey 08540. 1985. \$79.50.

This wonderful, huge book includes the proceedings of the Charles Darwin Centenary Conference held in the Florence Center for the History and Philosophy of Science in June 1982. Yes, wonderful for the thorough, intelligent, richly documented appraisals. Being supine for a couple of weeks gave me the chance to read this book carefully. PART I has 14 papers on phases of the evolution of a theorist such as "Darwin's Early Intellectual Development: An Overview of the 'Beagle' Voyage (1831-1836)" and "Charles Darwin and Alfred Russel Wallace: Two Decades of Debate over Natural Selection". PART II has 7 papers on Darwin in Victorian context such as "Darwin of Down: The Evolutionist as Squarson-Naturalist" and "Darwin and the World of Geology". PART III has 3 papers about comparative receptions of Darwinism in Britain and America, in Germany, France and Italy, and in Russia. PART IV has 7 papers on perspectives on Darwin and Darwinism including Ernst Mayr's "Darwin's Five Theories of Evolution" -- really parts of the whole -- about which he concludes that "It strikes me as almost miraculous that Darwin in 1859 came so close to what would be considered valid 125 years later". A. La Vergata has produced an excellent study in "Images of Darwin: A Historiographic Overview". "The BEAGLE Collector and His Collections" makes an effective finale. Advanced students, faculty and interested educated readers should find this book a treasure chest of factual information and ideas.

"THE ECOLOGY AND PHYSIOLOGY OF THE FUNGAL MYCELIUM" edited by D. H. Jennings & A. D. M. Rayner, xvi & 564 pp., 168 b/w multi-fig. incl. 186 photo. & 31 tab. Cambridge University Press, Cambridge, London & New York, N. Y. 10022. 1984. \$99.50.

This excellent book is composed of the invited papers for the Symposium of the British Mycological Society held at Bath University in 1983. "The primary function of the mycelium is that of establishment and spread in or on a suitable medium with concomitant absorption of nutrients and water" and showing the following "three important phenomena: (1) hyphal fusions or anastomoses, (2) perforate septa and (3) cytoplasmic and nuclear migration". The 24 papers attack effectively the "what" and the "how" of such processes as in a woodland litter decomposer, mycorrhizal roots, rhythmic growth and fungal sporulation, heterokaryosis in *Rhizoctonia solani* and nuclear and cytoplasmic genes that determine morphology and virulence in *Endothia parasitica*. This long ignored basic part of fungal organisms has now

been given its "just due" as has the pioneer work of Prof. A. H. R. Buller. For students and teachers of mycology and ecology this book offers essential orientation and enrichment.

"BIOTECHNOLOGY AND ECOLOGY OF POLLEN" edited by David L. Mulcahy, Gabriella Bergamini Mulcahy & Ercole Ottaviano, xxiii & 528 pp., 141 b/w fig. incl. 93 photo. & 71 tab. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1986. \$46.00.

These "Proceedings of the International Conference on the Biotechnology and Ecology of Pollen, 9--11 July 1985" have come into print so promptly because, like this journal, they are composed of the authors' typewritten papers reproduced in photo-offset form. A handful of misspellings and all possible shadings of ink slipped through. Besides "delivering male gametes to the egg", pollen also serves "to block alleles and gene combinations into the next generation.....simply because pollen tubes carrying defective haploid genotypes frequently fail to complete growth through the entire length of the style". There are 7 papers on gene expression, 20 on biotechnology, 17 on style interactions, 7 on ultrastructure, 12 on physiology, and 15 on gametophytic ecology. Some of the observations are based on statistically very limited material. These papers should certainly lead to important discussions and further studies.

"THE FIELD GUIDE TO PREHISTORIC LIFE" by David Lambert and the Diagram Group, 256 pp., 500+ 2-color illus., maps & charts. Facts on File Publications, New York, N. Y. 10016. 1985. \$17.95 hardcover & 1986 \$10.95 papercover.

The author is Cambridge trained: "the Diagram Group is a British book design studio, known worldwide for its ability to explore highly technical matters in easily absorbed text and pictures", making "the guide accessible to anyone from the inquiring eleven-year-old to the budding scientist". Also the general reader will find this format captivating and easily comprehensible. There are chapters on fossil clues to prehistoric life and on each of the following groups: plants, invertebrates, fishes, amphibians, reptiles, birds, and mammals now "masters of the land", records in the rocks through different periods and epochs on our changing planet, and the stories of fossil hunting and fossil hunters. There is a worldwide list of famous fossil collections in museums. Such an attractive introduction to prehistoric life -- even if the ginkgo tree sketch is hardly recognizable!

"SNAKES OF THE WORLD" by Chris Mattison, 190 pp., 100 color & b/w photos., 15 fig., 6 tab. & 12 maps. Facts on File Publications, Inc., New York, N. Y. 10016. 1986. \$17.95.

This inexpensive book, with its many excellent illustrations and interesting text, gives a fine overall yet considerably detailed account of what snakes are like as to their basic (taxonomic) characteristics, size, shape, colorings, exclusive carnivory, ovi- and ovoviviparous reproduction patterns, means of defense, feeding, relationships with their varied environments, geographical distribution, and relationships with man. Plants, of course, feature as food for their prey and milieu for their habitats. The final chapter is a fine survey of snakes by families.

"INTRODUCTION TO MODERN MYCOLOGY" by J. W. Deacon, vii & 197 pp., 80 b/w fig. incl. 21 photos. & 15 tab. Blackwell Scientific Publications, U. K. & Halsted Press of John Wiley & Sons, New York N. Y. 10158. 1980. \$18.95 paperbound.

The author has patterned this clearly presented and up-to-date text for undergraduate courses in the biology of fungi, related fields and for "microbiologists, botanists and biologists in general". There are chapters on various fungal life functions, germination, genetic systems [including parasexuality], saprophytes and plant and animal parasites, economic importance through the production of products like gibberillin and the causation of plant and animal diseases. The content is completely explained and well illustrated. This book belongs in all public, college and university libraries. It would make a good text in our junior colleges with the anticipation or requirement that all contents be learned through rather than just skimmed over as must be done with the much larger American texts. It would also provide a short and rich source for secondary school teachers of biology for their own background.

"ECOLOGY AND TROPICAL BIOLOGY" by Ian Deshmukh, xii & 387 pp., 152 b/w fig, 11 photo. pl., 5 maps & 46 tab. Blackwell Scientific Publications, Inc., Oxford OX2 OEL U.K. & Palo Alto, California 94301. 1986. \$19.95 paperbound.

Because of effective comparisons of ecological conditions and patterns between those of the temperate and tropical zones, this text provides interesting new perspectives to students, research workers and faculty in both the Old and the New Worlds. The first part of the well-explained text covers the ecology of natural systems (energy flow, nutrient cycles, populations of single and different species, evolution, communities and tropical terrestrial biomes) and the second part covers human ecology (food from foraging to fossil fuel, populations, deforestation, desertification, nature reserves). The author conspicuously defines terms before using them, makes clarifying and organizing use of many figures and tables throughout and of mathematic models in the appendix. This book is unique because it can serve English reading libraries in agricultural & technical schools, colleges & universities all over the world.

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THE VASCULAR FLORA OF FIVE ROCK GLACIERS IN THE SAN JUAN MOUNTAINS, COLORADO

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ABSTRACT

Rock glaciers are the most extensive Holocene glacial deposits in the Colorado Rocky Mountains. An inventory was taken of the vascular plant flora of five rock glacier complexes in alpine basins of the San Juan Mountains, Colorado. A flora of 89 species in 55 genera and 22 families is reported. Eight species were found only on the rock glaciers and not in the adjacent basins. Dominance within representative community types was analyzed.

Rock glaciers are the most common Holocene glacial deposits in the cirques of the Southern Rocky Mountains of Colorado (Meierding and Birkeland 1980). Many studies pertaining to the origin, age, morphology, ice composition, and movement of rock glaciers are found in the literature (Howe 1909, Capps 1910, Ives 1940, Wahrhaftig and Cox 1959, Outcalt and Benedict 1965, Barsch 1971, White 1971, White 1973, Ellis and Calkin 1979, Johnson 1983). Although there are some general references to the presence of vascular plants on rock glaciers in North America (Wahrhaftig and Cox 1959, White 1971, Madole 1972, White 1973, Carrara and Andrews 1976, Johnson 1983) no lists of species are given. The purpose of this study was to survey the vascular plant species present on five rock glaciers in the San Juan Mountains and to determine dominance within representative community types.

ROCK GLACIERS

Wahrhaftig and Cox (1959) describe rock glaciers as tongue-shaped or lobate masses of poorly sorted angular debris lying at the base of cliffs or talus slopes and ranging in size from a few hundred feet to over a mile in length, in the direction of flow, and a few hundred feet to nearly two miles in width, perpendicular to the direction of flow. Dimensions vary according to rock glacier type and topographic location. All rock glaciers have an ice component: either a central core of ice, superimposed by rock debris (ice-cored), or an interstitial matrix of ice (ice-cemented). The occurrence of rock glaciers also implies the occurrence of permafrost and a periglacial climate for maintenance of the landform (White 1981). The upper surface of most rock glaciers has a microrelief determined by a system of longitudinal and transverse ridges and furrows that give the impression of slow plastic or viscous flow (Wahrhaftig and Cox 1959).

There are two basic morphological types of rock glaciers. Tongue-shaped rock glaciers are usually ice-cored but may be ice-cemented (Madole 1972), have a greater length to width ratio, and originate in cirques where ice glaciers formerly occurred (White 1981) or in slight recesses on promontories or valley walls (Madole 1972). These forms have steep fronts of 38 to 50 degrees where basal shear resistance is great (White 1981).

Lobate rock glaciers are usually ice-cemented, have a greater width to length ratio, and form at the base of valley walls, usually as an extension of talus (White 1981). These forms have steep fronts of 40 to 55 degrees.

On the basis of movement rock glaciers may be categorized as active or inactive. Active tongue-shaped rock glaciers move 5-160 cm/yr depending upon size and slope angle whereas the lobate forms move substantially less, 1-6 cm/yr (White 1981). The front slopes of active rock glaciers are completely devoid of vegetation and form a sharp angle with the surface of the glacier. Inactive rock glaciers show no movement. The front slopes of the latter are covered with turf or lichens and are rounded at the junction of slope and surface (Wahrhaftig and Cox 1959).

In Colorado rock glaciers are reported for the Front Range, Mosquito Range, Sawatch Range, Elk Mountains, Sangre de Cristo Range, and San Juan Mountains. White (1973) identified 756 rock glaciers from aerial photos of the San Juan Mountains. Rock glaciers occur primarily above timberline.

STUDY AREAS

The San Juan Mountains are a discontinuous section of the Southern Rocky Mountains situated along the Continental Divide in southwestern Colorado. They are composed largely of Tertiary volcanic tuffs and lavas that lie unconformably over metamorphic, sedimentary and volcanic intrusive rocks of Precambrian age as well as sediments of Paleozoic, Mesozoic, and early Cenozoic age (Casadwall and Ohmoto 1977). All of the rock glaciers studied are tongue-shaped or tongue-lobate complexes and show evidence of movement; however, isolated, stabilized areas of fines, which support well-developed vascular plant communities are present to some extent on all but Gilpin rock glacier.

American Rock Glacier

American rock glacier (37° 54' N; 107° 31' W) is located approximately 15 km southwest of Lake City, Hinsdale Co. This massive, north-facing complex of tongue and lobate units has an elevational range of 4026-3770 m, from source to frontal slope (Fig. 1). The headwall source of the rock glacier debris consists of volcanic aphanitic andesite, welded tuff, and biotite-quartz latite (Lipman 1976).

Imogene Rock Glacier

Imogene rock glacier (37° 56' 40" N; 107° 44' W), a northeast-facing tongue rock glacier, is located approximately 11 km south-southwest of Ouray, Ouray Co. It has an elevational range of 3721-3464 m, from source to frontal slope. Headwall source material for this rock glacier consists of biotite-quartz latite and fluvial-banded flows of rhyodacitic composition (Burbank and Luedke 1966).

Gilpin Rock Glacier

Originating high on the flanks of Gilpin Peak, the Gilpin rock glacier (37° 59' 35" N; 107° 47' 30" W) is located approximately 14.5 km southwest of Ouray, Ouray Co. Although north-facing at its source, at 3965 m elevation, the rock glacier makes a 45° bend and becomes east-facing near its frontal slope, at 3721 m elevation. Headwall material is Gilpin Peak tuff consisting predominantly of quartz latite welded ash flow tuffs (Burbank and Luedke 1964).

Kendall Rock Glacier

Kendall Rock Glacier (37° 47' 05" N; 107° 37' 48" W) is located approximately 8 km southeast of Silverton, San Juan Co. North-northwest-facing at the source end, this rock glacier also makes a 45° bend to west-facing at the front terminus. The elevational range, lowest of all five rock glaciers, is 3782-3599 m, from source to frontal slope. The headwall source of the rock glacier debris consists of bedded tuff, agglomerate, and breccia of andesite and latite (Burbank et al. 1935).

Burns Rock Glacier

Located approximately 19 km northeast of Silverton, San Juan Co., Burns rock glacier (37° 53' 45" N; 107° 32' 15" W) is a complex of multiple lobate units that coalesce to form a short, west-facing tongue at its terminus. The elevational range, from source to frontal slope, is 3904-3697 m. Biotite-quartz latite and aphanitic andesite constitute the primary rock debris of the glacier.

METHODS

This study was conducted over five field seasons, 1981-1985. The surface and slopes of each of the five rock glaciers were systematically traversed in order to locate and flag potential vegetated areas for floristic inventory and community analysis. A total of 154 vascular plant communities and/or single species populations were analyzed. Dominance, when applicable, was determined according to the Braun-Blanquet cover-abundance scale (Mueller-Dombois and Ellenberg 1974). Nomenclature follows Kartesz and Kartesz (1980) with alternate names used by Weber (1984) added in parentheses. Voucher specimens are deposited in COLO and CU-Denver.

RESULTS AND DISCUSSION

Flora

The alpine flora present on five rock glaciers in the San Juan

Mountains consists of 86 species representing 52 genera in 19 families of angiosperms, one species of gymnosperm, and two species in two genera of pteridophytes. The Asteraceae, Brassicaceae, and Cyperaceae are the leading families contributing 21%, 13%, and 8% of the taxa, respectively. The Poaceae, which is usually among the three leading families in most Colorado tundra floras (Michener 1964, Komarkova 1976, Webber et al. 1976, Hartman and Rottman 1985), is replaced by the Brassicaceae in this study. Eight species found on the rock glaciers were not found in the adjacent basins. These include: Agrostis filiculmis (Agrostis idahoensis), Arabis lemmonii (Boechea lemmonii), Draba incerta, Erigeron vagus, Penstemon harbourii, Phlox caespitosa ssp. pulvinata (Phlox pulvinata), Senecio porteri, (Ligularia porteri), and Stellaria irrigua.

Vascular plant species on the rock glaciers studied occur either in highly localized communities on stable sites or as isolated populations of single species in unstable areas. The community types represented are fellfield, dry meadow, moist meadow, and krummholz. Single species populations are characteristic of rock crevices and rock debris habitats.

Rock Debris

Because the rock glacier surface and slopes are formed of rock debris from the headwall or source area, rock debris is the most abundant habitat found on the five rock glaciers studied. The debris ranges in size from large boulders, up to two m in diameter, to cobbles and fines. There are limited areas in rock interstices and at the base of boulders on the rock glacier that have a sufficient accumulation of fines to support vascular plant species. These areas become available for colonization when the surficial deposits of rock material move down slope exposing the finer material present in the lower strata. Creeping-stemmed species such as Erigeron vagus, Penstemon harbourii, Senecio porteri (Ligularia porteri), and Stellaria irrigua are occasionally found among the rock debris. Many of the rock debris habitats, especially rock interstices, support only single species populations. Where fines and soil accumulation occur in flat areas at the base of boulders, communities of low richness and no dominance are found. Some of the common species that may occur singly or in some combination in rock debris habitats are Androsace septentrionalis, Aquilegia coerulea, Cerastium earlei (Cerastium beeringianum ssp. earlei), Draba crassifolia, Festuca brachyphylla, Potentilla diversifolia, Saxifraga debilis (Saxifraga hyperborea ssp. debilis), Senecio werneriiifolius (Packera werneriiifolia), Sibbaldia procumbens, Smelowskia calycina, and Trisetum spicatum.

Rock Crevice

The rock crevice habitat includes soil-filled crevices on solitary boulders. These crevices are formed by jointing of the rock material. Younkin (1970) reports that the thin soils in the rock crevices are often composed of organic matter and that the orientation of the crevices on the rock substrate determines the insolation factors of the particular habitat. On all of the rock

glaciers the rock habitat is usually represented by a single species population. Although species may occur together in this habitat, there are no dominants. The species most frequently encountered are Carex elynoides, Claytonia megarhiza, Erysimum capitatum var. amoenum (Erysimum capitatum, alpine ecotype), Festuca brachyphylla, Polemonium viscosum, Sagina saginoides, Saxifraga rhomboidea (Micranthes rhomboidea), Senecio amplexans var. amplexans (Ligularia amplexans), Senecio amplexans var. holmii (Ligularia holmii), and Smelowskia calycina.

Fellfield

Fellfield community sites are characterized by a high proportion of weathered rock material (up to 80%), coarse-textured soils, and little organic material. They occur on exposed, windswept ridges with little or no snow cover, thus exposing the plants and soil to severe desiccation. The highest richness of species on rock glaciers occurs in this community. The dominants include Carex elynoides, Chionophila jamesii, Selaginella densa, Senecio werneriiifolius (Packera werneriiifolia), Silene acaulis var. subacaulis (Silene acaulis ssp. subacaulescens), and Trisetum spicatum.

Dry Meadow

This community type occurs in stable areas on convex slopes that experience early snowmelt. Although the substrate includes some rock fragments, soil accumulation is sufficient to permit a better development of vegetation than the fellfield. The most frequent dominants are Carex elynoides, Geum rossii var. turbinatum (Acomastylis rossii ssp. turbinata), Phlox caespitosa ssp. pulvinata (Phlox pulvinata), Saxifraga bronchialis ssp. austromontana (Ciliaria austromontana), and Selaginella densa.

Moist Meadow

In striking contrast to the moist meadow communities in the adjacent basins (Hartman and Rottman 1985), the rock glacier moist meadows are low in species richness and minimal in occurrence, being found only on Imogene rock glacier. They occur in depressions where snow accumulation is greater and release is later at or near the base of a highly stable longitudinal lobe. The dominant species are Salix reticulata ssp. nivalis and Sibbaldia procumbens.

Krummholz

Wardle (1974) defines timberline as the ecotone between the subalpine zone, including both forest and ecotonal krummholz, and the alpine zone of low growing vegetation. He describes krummholz as a modification of the normal upright conifer growth form caused by the severity of the habitat. In the most severe sites krummholz conifers are reduced cushions of contorted stems that are shorn off level with the surface of the winter snowpack. In less severe sites, erect stems with branches only on their leeward sides rise above the cushion to produce flagged krummholz. Kendall rock glacier is the only rock glacier on which krummholz, of the mixed cushion and flag types, occurs at approximately 3652 m elevation. Picea engelmannii

is the only gymnosperm species represented in four scattered communities. The understory dominants include Carex elynoides and Salix reticulata ssp. nivalis.

INVENTORY OF VASCULAR PLANT SPECIES ON ROCK GLACIERS
SAN JUAN MOUNTAINS, COLORADO

Achillea millefolium L. var. lanulosa (Nutt.) Piper
(Achillea lanulosa Nutt.)

krummholz

Agropyron scribneri Vasey
(Elymus scribneri [Vasey] Jones)

rock debris, fellfield

Agrostis filiculmis M.E. Jones
(Agrostis idahoensis Nash)

dry meadow

Androsace septentrionalis L.
rock debris, fellfield, dry meadow

Angelica grayi Coult. & Rose
rock debris, fellfield, dry meadow

Antennaria alpina (L.) Gaertn
(Antennaria media Greene)

rock debris, fellfield

Antennaria microphylla Rydb.
fellfield, dry meadow, moist meadow, krummholz

Aquilegia coerulea James
rock debris, fellfield, dry meadow, moist meadow, krummholz

Arabis divaricarpa A. Nels.
(Boechera divaricarpa [A. Nels.] Love & Love)

rock debris

Arabis drummondii Gray
(Boechera drummondii [A. Gray] Love & Love)

krummholz

Arabis lemmonii S. Wats.
(Boechera lemmonii [S. Wats.] W. Weber)

rock debris

Arnica mollis Hook.
rock debris

Artemisia scopulorum Gray
fellfield, dry meadow, moist meadow, krummholz

Besseyia alpina (Gray) Rydb.
rock debris, fellfield

Carex albonigra Mackenzie
rock debris, fellfield, moist meadow

Carex arapahoensis Clokey
rock debris

Carex elynoides Holm
rock debris, rock crevice, fellfield, dry meadow, krummholz

Carex heteroneura W. Boott var. chalciolepis (Holm) F.J. Herm.
(Carex chalciolepis Holm)

rock debris, fellfield, dry meadow, moist meadow, krummholz

Carex phaeocephala Piper
rock debris, fellfield, dry meadow, krummholz

- Carex pseudoscirpoidea Rydb.
rock debris
- Carex pyrenaica Wahlenb.
(Carex crandallii Gand.)
rock debris
- Castilleja haydenii (Gray) Cockerell
rock debris, krummholz
- Cerastium earlei Rydb.
(Cerastium beeringianum C. & S. ssp. earlei [Rydb.] Hulten)
rock debris, fellfield
- Chionophila jamesii Benth.
rock debris, fellfield
- Claytonia megarhiza (Gray) Parry ex S. Wats.
rock debris, rock crevice, fellfield, krummholz
- Cystopteris fragilis (L.) Bernh.
krummholz
- Draba aurea Vahl
dry meadow
- Draba crassa Rydb.
rock debris
- Draba crassifolia Graham
rock debris, fellfield
- Draba incerta Payson
rock debris
- Erigeron grandiflorus Hook.
moist meadow, krummholz
- Erigeron melanocephalus A. Nels.
rock debris, dry meadow
- Erigeron pinnatisectus (Gray) A. Nels.
rock debris, rock crevice, fellfield, dry meadow, krummholz
- Erigeron simplex Greene
rock debris, fellfield, dry meadow, krummholz
- Erigeron vagus Payson
rock debris
- Erysimum capitatum (Dougl.) Greene var. amoenum (Greene) R.J. Davis
(Erysimum capitatum [Dougl.] Greene, alpine ecotype)
rock debris, rock crevice, fellfield, dry meadow
- Festuca brachyphylla Schultes
rock debris, rock crevice, fellfield, dry meadow, krummholz
- Geum rossii (R. Br.) Ser. var. turbinatum (Rydb.) C.L. Hitchc.
(Acomastylis rossii [R. Br.] Greene ssp. turbinata [Rydb.] W. Weber)
rock debris, fellfield, dry meadow, moist meadow, krummholz
- Hymenoxys grandiflora (Torr. & Gray ex Gray) Parker
(Rydbergia grandiflora [T. & G.] Greene)
krummholz
- Lloydia serotina (L.) Salis. ex Reichenb.
rock debris, fellfield, dry meadow
- Luzula spicata (L.) DC.
rock debris, dry meadow, moist meadow, krummholz
- Minuartia obtusiloba (Rydb.) House
(Lidia biflora [L.] Love & Love)
fellfield, dry meadow, krummholz

- Minuartia rubella (Wahlenb.) Hiern
(Tryphane rubella [Wahlenb.] Reichenb.)
fellfield
- Oreoxis alpina (Gray) Coult. & Rose
dry meadow, moist meadow
- Oreoxis bakeri Coult. & Rose
fellfield, dry meadow, moist meadow, krummholz
- Oxyria digyna (L.) Hill
rock debris, fellfield
- Penstemon harbourii Gray
rock debris, fellfield
- Penstemon whippleanus Gray
krummholz
- Phacelia sericea Hook.
rock debris, fellfield
- Phlox caespitosa Nutt. ssp. pulvinata Wherry
(Phlox pulvinata Wherry)
rock debris, dry meadow, moist meadow
- Picea engelmannii Parry ex Engelm.
krummholz
- Poa alpina L.
rock debris, fellfield, dry meadow
- Poa rupicola Nash ex Rydb.
(Poa glauca Vahl)
rock debris, fellfield, dry meadow, krummholz
- Polemonium viscosum Nutt.
rock debris, rock crevice, fellfield, krummholz
- Polygonum bistortoides Pursh
(Bistorta bistortoides [Pursh] Small)
fellfield
- Polygonum viviparum L.
(Bistorta vivipara [L.] S. Gray)
rock debris
- Potentilla diversifolia Lehm.
rock debris, fellfield, dry meadow, krummholz
- Ranunculus macauleyi Gray
rock debris, fellfield, dry meadow, moist meadow
- Sagina saginoides (L.) Karst
rock debris, rock crevice
- Salix glauca L.
fellfield, dry meadow, krummholz
- Salix reticulata Hook. ssp. nivalis (Hook.) Love, Love & Kapoor
fellfield, dry meadow, moist meadow, krummholz
- Sambucus racemosa L. ssp. pubens (Michx.) House
rock debris
- Saxifraga adscendens L. ssp. oregonensis (Raf.) Bacig.
(Muscaria adscendens [L.] Small)
fellfield
- Saxifraga bronchialis L. ssp. austromontana (Wieg.) Piper
(Ciliaria austromontana [Wieg.] W. Weber)
rock debris, fellfield, dry meadow, krummholz
- Saxifraga debilis Engelm. ex Gray

(Saxifraga hyperborea R. Br. ssp. debilis [Engelm] Love, Love & Kapoor)

rock debris, fellfield, dry meadow

Saxifraga flagellaris (Sternb.) Willd. ssp. platysepala (Trautv.) Porsild

(Hirculus platysepalus [Trautv.] W. Weber ssp. crandalli [Gand.] W. Weber)

rock debris, fellfield

Saxifraga rhomboidea Greene

(Micranthes rhomboidea [Greene] Small)

rock debris, rock crevice, fellfield, dry meadow, moist meadow, krummholz

Sedum integrifolium (Raf.) A. Nels. ex Coult. & A. Nels.

(Rhodiola integrifolia Raf.)

rock debris, fellfield, dry meadow

Sedum lanceolatum Torr.

(Amerosedum lanceolatum [Torr.] Love & Love)

fellfield, dry meadow

Selaginella densa Rydb.

rock debris, rock crevice, fellfield, dry meadow, moist meadow

Senecio amplexans Gray var. amplexans

(Ligularia amplexans [A. Gray] W. Weber)

rock debris

Senecio amplexans Gray var. holmii (Greene) Harrington

(Ligularia holmii [Greene] W. Weber)

rock debris, fellfield, dry meadow, krummholz

Senecio porteri Greene

(Ligularia porteri [Greene] W. Weber)

rock debris

Senecio soldanella Gray

(Ligularia soldanella [Gray] W. Weber)

rock debris, fellfield

Senecio werneriiifolius Gray

(Packera werneriiifolia [Gray] Weber & Love)

rock debris, fellfield, dry meadow, moist meadow, krummholz

Sibbaldia procumbens L.

rock debris, rock crevice, fellfield, dry meadow, moist meadow

Silene acaulis (L.) Jacq. var. subacaulis (F.N. Williams) C.L.

Hitchc. & Maguire

(Silene acaulis (L.) Jacq. ssp. subacaulescens [F.N. Williams]

Hitchc. & Maguire)

rock debris, fellfield, dry meadow, moist meadow

Smelowskia calycina (Steph.) C.A. Mey. ex Ledeb.

rock debris, rock crevice, fellfield, dry meadow

Stellaria irrigua Bunge

rock debris

Stellaria umbellata Turcz. ex Kar. & Kir.

rock debris, fellfield

Taraxacum ceratophorum (Ledeb.) DC.

rock debris, dry meadow

Taraxacum lyratum (Ledeb.) DC.

fellfield

- Thlaspi montanum L.
(Noccaea montana [L.] F.K. Meyer)
rock debris, dry meadow
- Trifolium attenuatum Torr. & Gray
rock debris
- Trifolium nanum Torr.
rock debris, fellfield, dry meadow
- Trisetum spicatum (L.) Richter
rock debris, fellfield, dry meadow, krummholz
- Vaccinium scoparium Leib.
moist meadow
- Valeriana capitata Pallas ex Link
moist meadow
- Zigadenus elegans Pursh
(Anticlea elegans [Pursh] Rydb.)
fellfield, dry meadow

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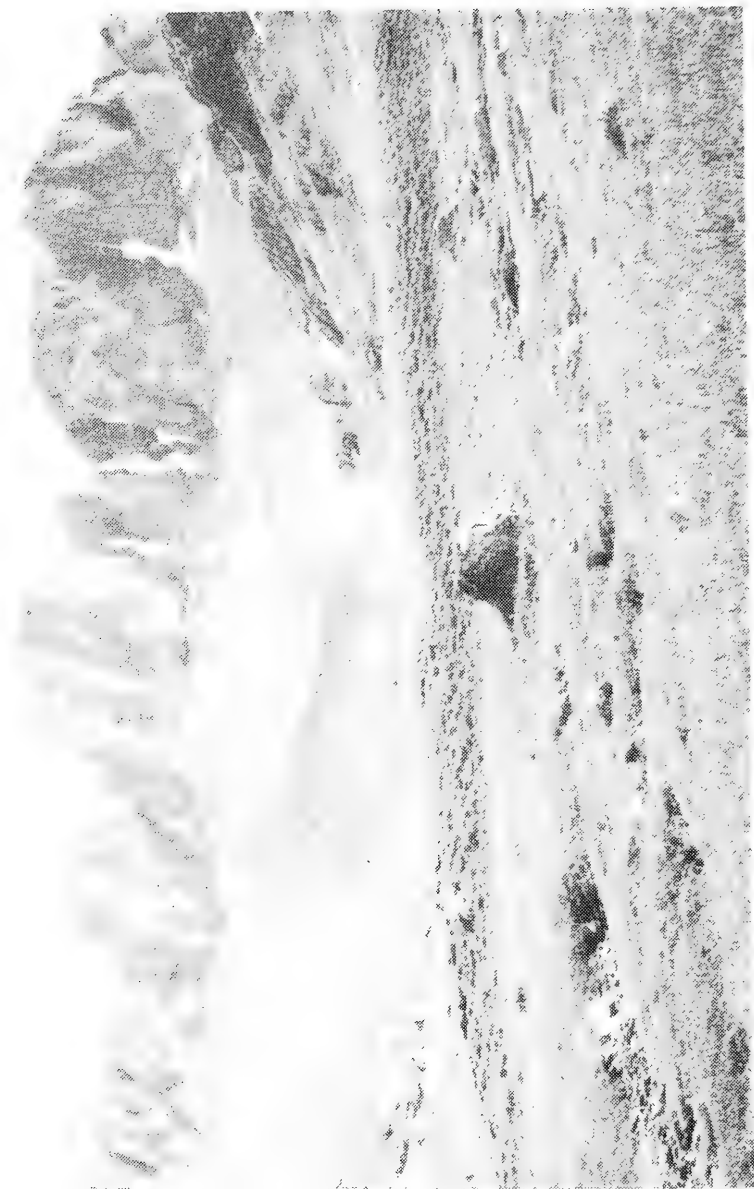


Fig. 1 American rock glacier and headwall, American Basin. East and west lobate units in background; coalesced tongue-shaped unit in center.

NOTES ON RARE U. S. PLANTS FROM ARIZONA, I: INCLUDING A TALINUM
(PORTULACACEAE) NEW TO THE U.S.

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A number of the rarer plants in the U.S. flora are to be found only in extreme southeastern Arizona. Most of these are Mexican peripherals - species centered in Mexico that have limited distributions north of the International Boundary. Of some 60 such species in Arizona, 41 occur nowhere else in the U.S. In addition, at least 23 endemics are native to the southeastern corner of the state. While most of the peripheral and endemic species have been on record for many years, little or no information on their numbers, local distributions, habitats, or population trends has been published. This paper is the first in a series intended to provide some such basic information.

The area covered in this series (see Fig. 1) includes Cochise, Santa Cruz, southern Graham and Pinal counties, and eastern Pima County. Southeastern Arizona has long been known for the diverse and interesting biota that it supports, deriving from the region's geographical location, its strikingly varied topography, climate, and the resulting diversity of habitats. Our area shares portions of three Biotic Provinces: Sonoran, Chihuahuan, and Madrean. Descriptions of the physical and biotic features of the region are available elsewhere (Lowe, 1964; Brown & Lowe, 1978 (map); Brown et al., 1982). Certain localities within the larger area considered here harbor concentrations of diversity, including rare forms. Typically, these localities are associated with mountainous terrain, especially where riparian canyon habitats are present, as at Sycamore Canyon in the Pajarito Mts. (Toolin et al., 1979).

In the following discussions, all specimens cited are deposited at ARIZ, unless otherwise noted. I thank R. W. Kiger for identifying the Talinum, G. Russel for providing label information from Talinum specimens at US, and C. Sternberg for the map.

PORTULACACEAE

Talinum marginatum Greene (1912)

A low, herbaceous perennial previously known from a few scattered collections in Mexico. The first U. S. specimen came from Ramsey Canyon, Huachuca Mts., Cochise Co., 20 July 1980, L. J. Toolin 920 (ARIZ & US). The type was collected at Santa Teresa, near Tepic, Nayarit, Mexico, by J. N. Rose in 1897. Other collections known to me, but not seen, are from northwestern Chihuahua, near Colonia Garcia, Townsend & Barber 151, in 1899 (US); at an unspecified locality of the Sierra Madre, Chihuahua, E. W. Nelson 6094, also in 1899 (US).

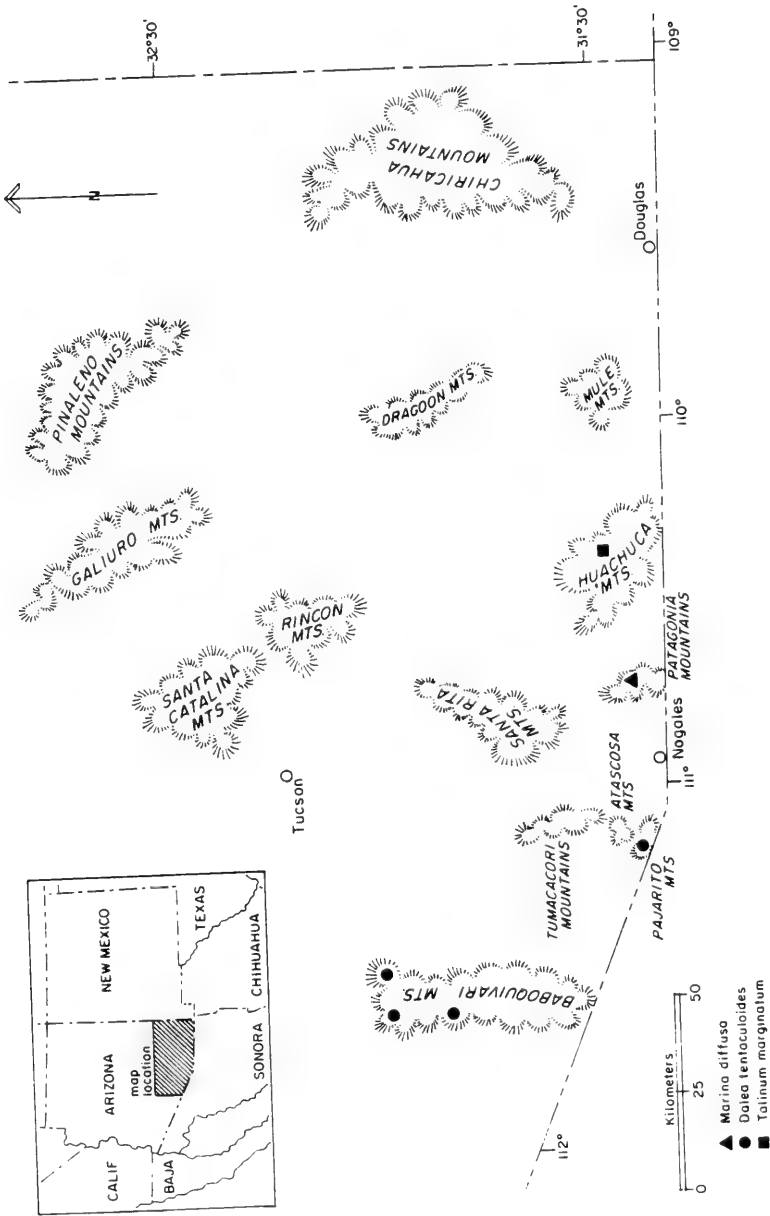


Figure 1 : United States localities for species discussed

This species appears to be rather specialized, growing only in open patches of thin gravel soil that are devoid of other perennial plants. The Ramsey Canyon population consists of about 250 individuals growing in pine-oak woodland at 1800 m elevation, in association with such annuals as Dalea filiformis, Crotalaria sagittalis, and Ipomoea costellata. A second population of the same size occupies similar habitat in adjacent Carr Canyon, at 2300 m. elevation. Both populations have maintained roughly the same numbers over the last six years.

T. marginatum has, as now known, a very wide and disjunct distribution. Its range covers 1000 km along the Sierra Madre Occidental. The climates under which this species grows vary dramatically: the Tepic region is tropical and completely frost-free, while the Huachuca Mts. undergo long periods of freezing weather during the winter.

The paucity of records for T. marginatum suggests that it may be truly rare and widely disjunct, for although it is a small plant (to 8 cm tall), its bright yellow flowers stand out in the bare situations in which it grows. Whether this is a true picture of the species' distribution will, it is hoped, be determined by future collection and a recently-initiated search of Mexican herbaria. I have found that these plants usually produce some cleistogamous flowers with viable seed. The ability to self-fertilize explains, in part, the establishment and persistence of populations in widely scattered localities.

Published descriptions (Greene 1912; Wilson 1932), based solely on pressed specimens, are largely inaccurate and lack some details. T. marginatum is acaulescent, the leaves and inflorescence arising from the apex of the tuberous roots, which vary in shape from nearly globose to fusiform. The leaves have been described as much flattened, oblong-spatulate, obtuse, with blades 1-2 cm long. The inflorescence is said to be shorter than the leaves. In fact the leaves are terete, 1.5-2.5 mm in diameter, more-or-less linear, with blades up to 6 cm long. The inflorescence commonly equals or exceeds the leaves. The petals are mostly 2.5-3.5 mm long. This species can be distinguished from other Arizona Talinums by its combination of yellow flowers in a cymose inflorescence.

Specimens examined: Arizona, Cochise Co., Huachuca Mts., ridge at west side of Ramsey Canyon, Toolin 920 & 1447; Huachuca Mts., Carr Canyon, near the Reef, F. Reichenbacher 1091. Mexico, Sonora, Sierra Charuco, in gravel atop boulder, H. S. Gentry 2303.

LEGUMINOSAE

Dalea tentaculoides H. S. Gentry (1950).

A shrub endemic to Santa Cruz and Pima counties, known from Sycamore Canyon, Pajarito Mts., Santa Cruz Co. (the type locality), and the Baboquivari Mts., (including the adjacent Quinlan and Coyote Mts.). This species appears to have lost ground in the Baboquivaries. Several collections were made from canyons on the west slope of the range in the 1920's and 1930's, but a 1981 survey of those localities failed to locate a single specimen. Since the west slope habitats have been strongly modified by livestock grazing, the populations may have been exterminated within the last fifty years. D. tentaculoides still occurs in the Baboquivari Mts. region, at least on Kitt Peak (Quinlan Mts.), where several were seen in 1984 at 1450 m elevation (G. Starr, pers. comm.), and in Mendoza Canyon (Coyote Mts.). The shrub almost certainly grows elsewhere in the northern end of the Baboquivaris, but its distribution and numbers there are still poorly known. In Sycamore Canyon, Pajarito Mts., about 100 individuals grow in partial shade under oaks, cottonwoods, ash, and sycamores at elevations of 1125 - 1215 m. The population is distributed as scattered colonies and individuals over a two-mile stretch of the main canyon, and in a few side drainages. Plants bloom twice a year, in spring and in fall.

No seedlings were found from 1980 to 1983, but a number have been produced since then. Seedling establishment may be dependent on summer rainfall, since the several summers preceeding 1983 were drier than normal, while winter rainfall was average. Observations on age distribution in colonies suggest that seedling production and establishment are dependent on particularly favorable conditions of erratic occurrence. In one example, five fully mature specimens with strongly woody stems are clustered with 20 smaller, younger, mostly suffrutescent plants. The younger individuals are essentially identical in height, main stem diameter, and branching. They seem to have germinated and become established at the same time. The lack of intermediates between the two age/size groups in the cluster indicates that additions to the population are episodic.

Both Gentry (1950) and Barneby (1977) note that D. tentaculoides has no close relatives. This, along with its present limited range, implies that it is an old, relictual species.

Specimens Examined: Santa Cruz Co., Pajarito Mts., Sycamore Canyon: R. Darrow, s.n., May 1941 (Holotype, ARIZ); J. M. Kaiser 1275; Toolin 1389; L. Benson 10960; L. N. Goodding, s.n., May 1938. Pima Co., Baboquivari Mts., Baboquivari Canyon: Loomis & Peebles 1597; Peebles & Harrison 3965; Kearney & Peebles 8543. Quinlan Mts., Kitt Peak: G. Starr 762. Coyote Mts., Mendoza Canyon: W. E. Niles 497.

Marina diffusa (Moric.) Barneby (1977).

Dalea diffusa Moric.

A peripheral Mexican shrub distributed from Sonora south to Guatemala. Type from "Nova Hispania" (Mexico), collected by M. Pavon in 1827. First collected in the U.S. in the Patagonia Mts., Santa Cruz Co., in 1934, Kearney & Peebles 10054. In the U.S., this species has a very limited range, and has not been known to number more than about 25 adults at one time. The population is confined to a south-facing rocky slope, in fine gravel soil derived from decomposing granite, at 1680 m elevation. Although this shrub is short-lived here, at its northernmost locality, reproduction seems adequate to maintain and even increase population numbers. Each adult produces a few seedlings in most years. Observation has shown that population growth in this frost-sensitive plant is limited by episodes of abnormally cold weather, as in 1978, when all individuals were killed by a hard freeze. The population is carried through these disasters by its reserve of seeds, which may remain viable for several years.

Barneby (1977), describing the species as known in Mexico, states that individuals develop persistent woody stems after several years' growth, and that these give rise to secondary suffrutescent stems during the growing season. Individuals in the Patagonia Mts. rarely live long enough to develop woody stems. Typically, these plants produce short-lived suffrutescent stems each year from a more-or-less woody caudex. Plants seen as lush, vigorous shrubs in the fall are found in the following spring with the above-ground growth reduced to a tangle of dead branches. Brown (1984) pointed out that for a given species (animal or plant), suitable local sites will decrease in number towards the margin of a species range, and that such localities will be increasingly unfavorable. The Patagonia Mts. M. diffusa population seems to be living at the very edge of its ecological limits. Barneby (1977) mentions that this species tends to form colonies, and our M. diffusa largely follow that pattern. Clusters of eight or so individuals are scattered over a few hectares. Persistence of these colonies is dependent on climatic conditions, and they come and go rather rapidly.

M. diffusa shares its Patagonia Mts. habitat with Dalea pulchra, Mimosa biuncifera, Brickellia coulteri, Yucca schottii, scattered Quercus emoryi, and variety of grasses. The nearest Mexican populations are about 250 km to the south, in northeastern Sonora and northwestern Chihuahua.

Specimens examined: Arizona, Santa Cruz Co., Patagonia Mts., Sycamore Canyon, Kearney & Peebles 10054; J. M. Kaiser, s.n., Oct. 1967; Toolin & Starr 2166. Mexico, Sonora, Rio de Bavispe, S. S. White 3707 3948; Sierra Chuna, H. S. Gentry 1369; Chihuahua, Rio Bonito, H. LeSeuer 1216.

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IXORAS MALGACHES NOUVEAUX A FLEURS SOLITAIRES

Michel Guédès

Abstract : New *Ixora*, with solitary flowers, from Madagascar. Three new species with solitary flowers, belong in a new Section, *Microthamnus* A.M. Hom. ex Guéd. sect. nov. : *I. reducta* Drake ex Guéd., *I. sambiranensis* A.M. Hom. ex Guéd. and *I. bemangidiensis* Guéd. spp. nov. are described. A new combination, *I. littoralis* (A.M. Hom. ex J. Arènes) Guéd. is made. The existence of species of *Ixora* bearing 3-4-carpel ovaries modifies the concept of the genus, a new diagnosis, *Ixora* L. emend. Guéd., is given.

Bremekamp (1937) déclarait ne pas connaître d'*Ixora* à fleurs isolées. Trois espèces qui avaient reçu l'épithète "uniflora" n'étaient pas, en fait, des *Ixora*. Cependant, la révision des espèces malgaches révèle l'existence de quatre taxa à fleurs solitaires qui appartiennent à deux groupes naturels distincts à l'intérieur du genre *Ixora*.

Ixora reducta Drake ex Guéd. avait été étudié et nommé par Drake del Castillo d'après un échantillon de Humblot (n° 408). Il n'a pas été publié jusqu'à maintenant. La plante (fig. 1) semble être un arbrisseau (1) à rameaux contournés munis de feuilles opposées-décussées, assez largement ovoïdes, progressivement rétrécies en pétiole, longues d'environ 2-2,5 cm, à limbe mince et glabre. Les colliers stipulaires sont de forme banale.

Les fleurs terminent de courts rameaux et leurs ovaires infères sont enveloppés dans un involucre constitué de deux feuilles de petite taille et de leurs deux stipules interpétiolaires relativement fort développées (fig. 1) et encore unies dans les aisselles foliaires.

Le calice enclos dans cet involucre possède 4 dents à peine marquées (fig. 2). La corolle, de couleur blanche, n'est connue qu'à l'état de bouton ; on ne peut se prononcer sur la longueur définitive de son tube. Elle a quatre lobes à préfloraison tordue dextre comme d'usage. Les étamines ont un filet relativement long, qui atteint les 2/3 de l'anthère. Le style est à deux stigmates aigus que je n'ai pas vu séparés. En l'absence de fleur épanouie, on ne peut se prononcer sur la longueur définitive.

L'ovaire est à deux loges uniovulées, le micropyle étant inférieur.

La récolte de Humblot provient des monts Antsianoka.

Une autre plante recueillie par R. Capuron (n° 23672-SF) au sud-est de là, entre Farafangana et Vohipeno, semble pouvoir être rapportée à cette espèce. Il s'agit d'un sous-arbrisseau à fruit rouge. Seule cette drupe à noyaux monospermes est connue dans son cas, mais elle présente deux feuilles involucreales (fig. 3) comme chez *I. reducta* et les feuilles sont très semblables à celles de cette espèce.

(1) Pourtant, le cahier d'Humblot lui attribue une hauteur de 15 m. On doit se demander si cette indication n'est pas erronée.

Ixora sambiranensis A.M. Hom. ex Guéd. a été nommé par A.M. Homolle à laquelle sont dus des travaux fort importants, restés jusqu'à maintenant inédits, sur les Rubiacées malgaches.

Il s'agit d'un arbuste de 1-2 m de hauteur, à feuilles coriaces, étroitement lancéolées, longues d'environ 4-6,5 cm, à marges étroitement révolutes, assez nettement discolorées. La nervation est plus apparente sur la face dorsale plus claire, souvent grisâtre. Les stipules sont longuement acuminées (fig. 4).

Les fleurs solitaires terminent de courts rameaux et leur ovaire est, là aussi, enveloppé dans une sorte d'involucre formé des bases de deux feuilles et de leurs stipules aristées (fig. 4). Ces deux feuilles peuvent montrer des bourgeons axillaires, peut-être susceptibles de croître ensuite en rameaux végétatifs. Le calice est à 4 lobes de forme variable, plus ou moins longuement triangulaires (fig. 5) et quelquefois érodés au bord. La corolle blanche a un tube d'environ 3 cm de longueur ; ses quatre lobes sont à préfloraison tordue dextre. Les quatre étamines ont des filets assez longs (fig. 4, 5) comme chez I. reducta. Le style est à deux stigmates renflés à la base et ne dépassant guère la moitié des lobes de la corolle dans la fleur ouverte, comme cela est général chez les Ixora. L'ovaire est à 2 loges uniovulées ; ovules à micropyle infère. Le fruit (fig. 6) est une drupe à deux noyaux uniséminés, à épicarpe probablement rouge.

La plante est connue surtout, quoique insuffisamment, grâce à deux récoltes de Perrier de la Bâthie (n° 3658, rocailles des torrents, Ankaizima, 1908 ; n° 3809, bords des torrents, massif de Manongarivo, 1909). Une autre plante récoltée plus récemment, un peu plus au nord, près d'Ambanja (Service des Eaux et Forêts de Madagascar, n° 7165 SF), appartient aussi à cette espèce. Un de ses rameaux au moins porte deux fleurs côte à côte, mais chacune est enveloppée de stipules de type végétatif et doit être considérée comme solitaire sur un rameau court. Néanmoins, on peut voir là une étape vers la réalisation d'une inflorescence.

Ixora bemangidiensis Guéd. (fig. 7) n'est que très imparfaitement connu et seulement par son type (Capuron, 22333-SF). C'est un sous-arbrisseau à fleurs blanches, à feuilles assez largement ovales et obtuses, munies de stipules longuement aristées. Les feuilles sont minces et concolores, à limbe très progressivement rétréci en pétiole.

La fleur termine un rameau (fig. 7) et son ovaire est enveloppé d'un involucre formé par les bases de deux feuilles stipulées comme chez I. sambiranensis. Le calice est à quatre dents minces et irrégulièrement érodées (fig. 8), caractère rencontré inconstamment dans l'espèce précédente. La corolle est blanche, à tube long de 25 mm. Les étamines ne sont pas connues mais leur filet semble assez long. Le style est à deux stigmates dépassant tout juste le tube de la corolle.

La seule récolte provient de la forêt de Bemangidy, au nord de Mahatalaky, non loin de Fort-Dauphin.

Les espèces de ce premier groupe peuvent se distinguer ainsi :

1. Feuilles petites, à limbe relativement large (1-2 cm x 1 cm) ; ovaire lâchement enclos dans le dernier verticille foliaire du rameau, à stipules très développées *I. reducta*
- 1'. Feuilles atteignant et dépassant 4 cm de longueur, lancéolées ; ovaire étroitement enclos dans le dernier verticille foliaire du rameau ; stipules longuement acuminées ou aristées.
2. Feuilles à limbe étroitement lancéolé (4,5 cm x 6 cm), discolores ; pétales larges de 3 mm. *I. sambiranensis*
- 2'. Feuilles à limbe largement lancéolé (3,5-4 cm x 1 cm), à peu près concolores ; pétales larges de 2 mm *I. bemangidiensis*

Dans ses notes manuscrites, A.M. Homolle a proposé de placer *Ixora reducta* dans une section nouvelle du genre, la sect. *Microthamnus*, caractérisée par des fleurs solitaires et un calice tronqué. *I. sambiranensis* et *I. bemangidiensis* s'y placeront aussi. Le calice de ces plantes, s'il n'est pas tronqué comme chez *I. reducta*, tend, du moins, à être érodé et à perdre ses dents (fig. 8). Cette section possédera ainsi des représentants du N au S de l'Ile. On trouvera, sans doute, des affinités avec des sections à fleurs en inflorescences, comme le laisse supposer *I. sambiranensis*. La délimitation des sections du genre *Ixora* reste d'ailleurs bien floue en l'absence de monographie mondiale du genre.

Ixora reducta Drake ex Guéd. sp. nov.

Frutex (?) caulibus juvenibus puberulis, foliis ovatis 20-25 mm longis, 10 mm latis, oppositis, decussatis, marginis stricte revolutis, subglabris. Stipulae interpetiolares acuminatae, intra foliorum axillas confluentes.

Flores solitarii ramulos terminantes, pedunculo subnullo, involucre duobus parvis foliis ingentibusque stipulis suis constituto, ovarium circumvenienti. Calyx tubo brevissimo, lobis quatuor latissimis brevissimis, 1 mm longus. Corolla alba, tubo longitudine ignota, lobis quatuor ad dexteram contortis. Stamina quatuor, fauci inserta, parviora lobis corollae, antheris dorso basi affixis, filamentis 2/3 antherae aequantis. Ovarium inferum biloculare, loculis uniovulatis. Ovulum micropyllo infero. Stylus exsertus, parvior lobis corollae, stigmata duo, acuta. Fructus drupaceus, ruber, 7 mm longus, 8 mm diametro, pyrenis duabus uniseminalibus.

Madagascar : Humblot 408 (Montes Antsianoka) ; Capuron 23672-SF (entre Farafangana et Vohipeno).

Typus : Humblot 408, Herb. Mus. Parisiense.

Ixora sambiranensis A.M. Hom. ex Guéd. sp. nov.

Frutex 1-2 m altus, ramosissimus, foliis coriaceis lanceolatis, 4-6,5 cm longis, 0,4-0,7 cm latis, discoloribus, pagina infera colore diluto, marginibus stricte revolutis, stipulis interpetiolaribus aristatis, intra foliorum axillas confluentibus.

Flores solitariis, ramulos terminantes, pedunculo subnullo. Ovarium duobus parvis foliis stipulisque suis circumvenientum. Calyx 1,5 mm longus, breve tubo, lobis brevibus triangularibus, nonnumquam erosis. Corolla alba, tubo 3 cm longo, lobis vix 1 cm longis, 0,3 cm latis, ad dextram contortis. Stamina fauci inserta, antheris 3,5 mm longis, dorsi basi insertis, filamentis 2 mm longis. Ovarium inferum biloculare, loculis uniovulatis, ovulis micropyle infero. Stylus filiformis exsertus, brevior lobis corollae, stigmata duo subacuta. Fructus ruber, drupaceus, subsphaericus, 7 mm diametro, pyrenis duabus uniseminalibus.

Madagascar : Perrier de la Bâthie 3758 (Ankaizim, Sambirano, sept. 1908) ; 3809 (Massif de Manangarivo, Sambirano, 1909) ; Eaux et Forêts Mad. 7165 SF (Andampidely, Ambanja, 4 Janvier 1953).

Typus : Perrier de la Bâthie 3758, in Herb. Mus. Parisiense.

Ixora bemangidiensis Guéd. sp. nov.

Suffrutex, folia lanceolata 3,5-4 cm longa, 1-1,5 cm lata, vix coriacea, fere concoloria, opposita, decussata, stipulis interpetiolaribus aristatis instructa.

Flores solitarii, ramulos terminantes, pedicula subnullo. Ovarium duobus parvis foliis stipulisque suis circumvenientum. Calyx 1 mm longus, tubo brevissimo, lobis quattuor brevissimis erosis. Corolla alba, tubo 2,5 cm longo, lobis quattuor 6 mm longis, 0,2 mm latis. Stamina fauci inserta, antheris ignotis, filamentis 1 mm longis. Ovarium biloculare, loculis uniovulatis ; stylus exsertus, stigmata duo apiculata tertiam partem corollae loborum non superantia. Fructus ignotus.

Madagascar : Forêt de Bemangidy, au N de Mahatalaky (Fort-Dauphin).

Typus : Capuron 22333-SF, in Herb. Mus. Parisiense.

Très voisin de *I. sambiranensis*, *I. bemangidiensis* n'est connu que par son type.

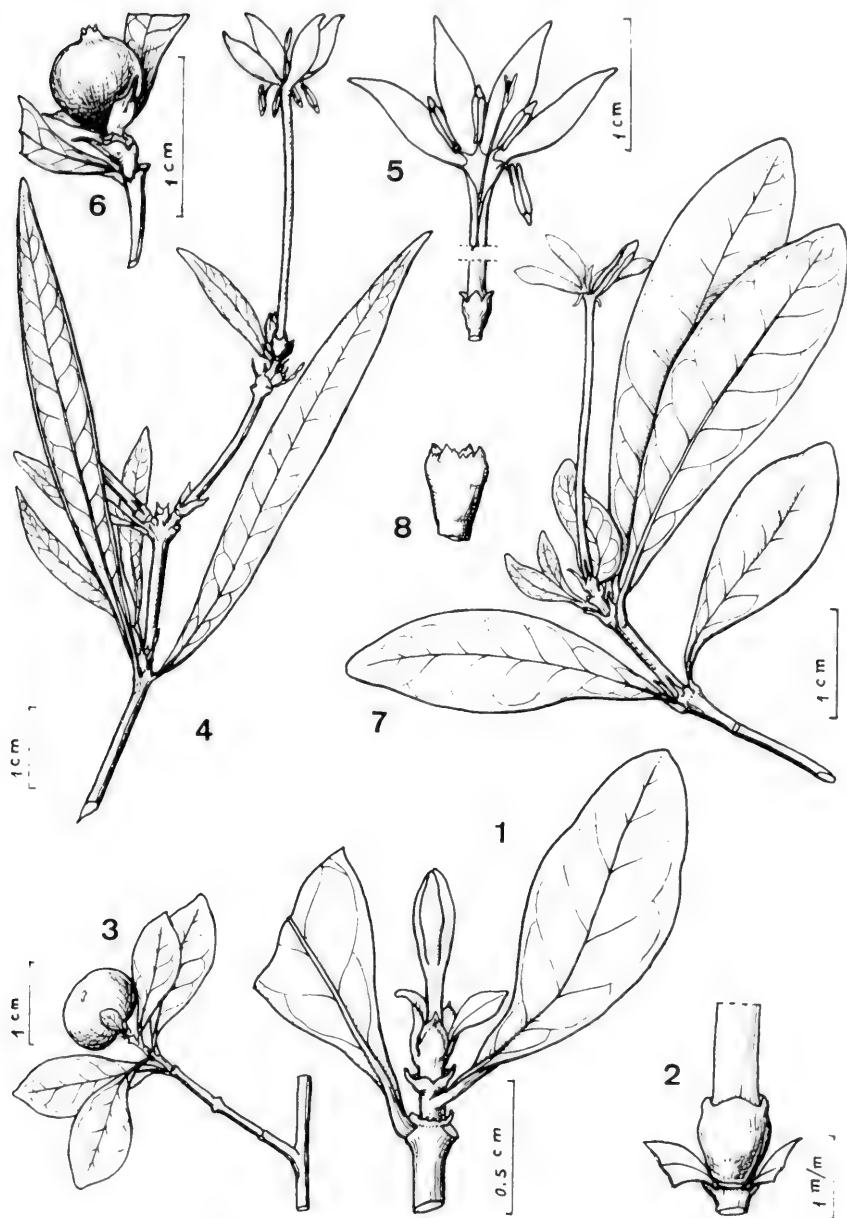
Ces trois espèces permettent de définir une section du genre *Ixora*, à fleurs solitaires, mais ne groupant pas toutes les espèces possédant ce caractère, puisque *I. littoralis* en est exclu. Cette section a été nommée Sect. *Microthamnus* par A.M. Homolle, nom publié ici : *Ixora* sect. *Microthamnus* A.M. Hom. ex Guéd. sect. nov.

Frutices foliis mollis vel coriaceis, sed non lucentibus. Flores solitarii, ramulos terminantes ; pedunculo subnullo. Ovarium duobus foliis stipulisque suis circumvenientum. Calyx parvus, 1-1,5 mm longus, tubo brevissimo, lobis quattuor triangularibus aut vix conspicuis, saepe erosis. Corolla tenuis, tubo circiter 2,5-3 cm longo, lobis circiter 1 cm longis. Stamina fauci inserta, antheris medium corollae loborum attingentibus, filamentis instar antherarum dimidii circiter longis. Ovarium biloculare, loculis uniovulatis ; stylus filiformis exsertus, stigmata duo extremitatem corollae non attingentia. Fructus drupaceus, pyrenis duabus uniseminalibus.

Madagascar

Typus : *I. reducta* Drake ex Guéd.

Un ensemble de plantes malgaches à fleurs solitaires dont, pour l'instant du moins, on ne peut constituer qu'une espèce, appartient



I. reducta : 1, inflorescence ; 2, calice ; 3, fruit 23672 SF.

I. sambiranensis : 4, rameau fleuri ; 5, fleur ; 6, fruit. 4-5 : 7165 SF ; 6 : 3758 P.-B.

Ixora bemangidiensis : 7, rameau fleuri ; 8, calice, 22333 Capuron.

à un groupe très différent représenté aussi en Nouvelle-Calédonie et, comme certains autres Ixora, possède 4 carpelles.

Ces plantes, probablement de petits arbres, ont des feuilles ovoïdes, longues de 3-10 cm, à bords révolutés, très coriaces, luisantes au-dessus. Les stipules interpétiolaires sont aristées et forment des colliers stipulaires par union dans les aisselles foliaires.

Les fleurs terminent de courts rameaux et la base de l'ovaire est enveloppée d'un involucre formé de deux feuilles très simplifiées, accompagnées de leurs deux stipules qui peuvent, parfois, manquer. Le calice qui atteint 1,6-1,8 cm, possède un tube au moins aussi long que les dents qui sont fort développées. La surface interne du tube est garnie de poils qui dépassent entre les bases des dents. On trouve fréquemment, entre toutes les dents ou certaines d'entre elles seulement, des appendices intermédiaires qui sont des stipules sépalaires unies. Les dents elles-mêmes, parfois subégales, sont souvent fortement inégales ; leur longueur varie de 0,5-0,9 cm. Le tube de la corolle est long de 3-4 cm et ses lobes de 1,5-2 cm. La corolle est très épaisse et présente presque la consistance du cuir. La préfloraison est fortement tordue - dextre. Les anthères ont environ 0,3 cm de longueur, elles sont donc très courtes par rapport aux lobes de la corolle, par comparaison avec les autres espèces d'Ixora.

L'ovaire infère montre quatre loges uniovulées. L'ovule est pendant et à micropyle infère. Le style est exsert mais les quatre stigmates aigus au sommet et renflés à la base ne dépassent pas le 1/3 des lobes de la corolle.

Le fruit est une drupe à quatre noyaux uniséminés, d'environ 1,5 cm de longueur et de 1 cm de diamètre. Il est surmonté du tube calicinal et de ses dents, qui ne semblent pas augmenter de taille après la fécondation.

Ces plantes proviennent des régions d'Ambositralanana (district d'Antalaha), d'Ambila et d'Ampangalana au N de Mananjary.

Cette espèce avait été nommée Thouarsiora littoralis A.M. Homolle ex J. Ar. et décrite avec les lobes de la corolle divariqués mais CAPURON (1969, *Adansonia*, 9 (1) : 48 avait envisagé qu'elle doit être rattachée aux Ixora.

Une nouvelle combinaison est nécessaire :

Ixora littoralis (A.M. Hom. ex J. Ar.) Guéd. comb. nov.

Thouarsiora littoralis A.M. Hom. ex J. Arènes, Not. Syst. 16 : 19. 1960. Type : Madagascar, Du Petit Thouars s.n°. Herb. Mus. Parisiense.

On pourrait être tenté, devant la variabilité du calice, de distinguer au moins deux taxa (avec ou sans stipules calicinales, et à feuilles involucreales munies ou non de stipules) mais le premier caractère au moins montre des cas intermédiaires et le problème nécessite, pour être étudié, un matériel plus abondant.

Il existe des Ixora à gynécée trimère qui forment un intermédiaire entre les deux séries : I. trichocalyx Hochreutiner et I. trimera (1) Guéd. qui reste à décrire sont dans ce cas. I. trimera appartient au même groupe que les Ixora étudiés ici, tandis que I. trichocalyx en est sûrement distinct. De plus, ces Ixora à 4 ou 3 carpelles se rapprochent, semble-t-il, d'espèces à 2 carpelles considérées comme des Ixora typiques, par exemple I. finlaysonian

Wallich ex Don qui semble spontané à Madagascar, et *I. foliicalyx* (1) Guéd. qui sera décrit ailleurs. Cette dernière espèce montre, par rapport aux autres *Ixora*, l'apparition d'un tube calicinal assez long et le raccourcissement des étamines, trois fois moins longues que les lobes de la corolle dans ce cas. La corolle est très longue (9-10 cm) et ses lobes sont plus épais que chez *I. finlaysoniana*. Les feuilles sont plus coriaces. Les *Ixora* tri- ou tétracarpellés sont ainsi liés aux *Ixora* typiques par des intermédiaires. Ils entreront, sans doute, dans une section spéciale qui comprendra aussi des plantes de Nouvelle-Calédonie, à deux carpelles. Ces espèces sont publiées ci-dessous.

Pour être bien circonscrite, cette section ne pourra être définie qu'après la révision des *Ixora* de Nouvelle-Calédonie, en particulier. D'autres plantes lui appartenant seront décrites ailleurs.

L'inclusion d'espèces uniflores et possédant 4 carpelles conduit à redéfinir le genre *Ixora*. De plus, N. Hallé a attiré mon attention sur l'existence, en Nouvelle-Calédonie, d'un *Ixora* cauliflore (*I. cauliflora* Montr.) et l'*I. ferrea* Benth. d'Amérique présente la même particularité dont il n'est point tenu compte dans les définitions du genre *Ixora*. On peut alors amender la définition du genre de la façon suivante, en s'inspirant de la diagnose de BREMEKAMP (1937 : 198-199) :

Ixora L. emend. Guéd. - Inflorescentia terminalis una vel inflorescentia cauliflora congesta, vel flos solitarius ramulum terminans, cum floribus tetrameris hermaphroditis, cum stigmatibus divaricantibus, cum endocarpio tenui genus hoc a generibus aliis Ixorearum distinguit.

Suffrutices, frutices an arbores. Folia opposita an rare ternata, petiolata an sessilia ; lamina margine integra, nec acarodomatis nec bacteriodomatis munita. Stipulae in vaginam amplexicaulem connatae. Flores solitarii terminales, vel inflorescentiae corymbosae an subpaniculatae, rare paniculatae, terminales, vel inflorescentiae congestae cauliflores. Ramuli infimi plerumque oppositi et articulati ; ramuli alii nunc oppositi et articulati, nunc nec oppositi nec articulati. Flores nunc in triades plus minusve distinctus dispositi, nunc omnes irregulariter dispersi, tetrameri et hermaphroditici, rare flores aliquid pentameri. Ovarium biloculare, triloculare vel tetraloculare. Ovula in placentas partes superiore dissepimenti affixas immersa, semper solitaria. Calyx lobatus, dentatus an truncatus. Corolla lobis dextrorse contortis. Stamina antheris sagittatis et apiculatis, filamentis brevibus vel tam longis quam antherarum dimidium aut duae partes, fauce inserta, flore aperto depletis. Discus annularis crassus. Stylus filiformis parte exserta stigmata duo-triavel quattuor semper divaricantia comprehendentia corollae lobis subaequilonga an eis breviora. Drupa nunc globosa, nunc paulo complanata et bisulcata, uni-, bi-, tri- an tetrapyrena. Pyrenae uniseminales endocarpio tenui. Semina endospermo integro.

Distributio pantropicalis.

Typus : *I. coccinea* L.

Travaux cités

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1) Afin de valider ces binômes je donne les diagnoses latines :

I. trimera Guéd. spec. nov.

Arbor ? Altitudo ignota. Folia coriacea, elliptica, usque 21 x 5 cm, lamina in petiolum decurrens ; nervus medianus in inferiore facie projectus ; nervi secundarii numerosi, paralleli. Inflorescentiae axillares, uniflorae. Pedunculus 6,5 mm longus. Bractee 2, lineares, concavae, calyci breviores, intus pilosae. Flores 4-meri. Calyx oblongus, 12 mm latus ; lobuli oblongi, obtusi, breviter mucronati, ad 1/3-1/2 longitudinis calycis, intus omnino pilosi. Corolla tubo 6,5 mm longo, tenui : lobuli late obovati (\pm 12 mm), basi attenuati, patuli vel reflexi. Stamina filamento valde brevi, in margine tubi inserto. Ovarium circa 2,5 mm longum, bi-triloculare, 2-3-ovulatum. Stigma 2-3, linguiformia.

Stipulae 2, in vagina connatae, subcirculares, \pm 3 mm longae, mucronatae, intus pilosae, in margine dense ciliatae.

Typus : Madagascar, Maroarivo, Vohijeno, 6500 SEFN, 25 XI 1952 Herb. Mus. Parisiense.

I. foliicalyx Guéd. spec. nov. Arbor ad 9 m attingens. Petiolus crassus ad 15 mm longus. Folia coriacea ad 23 x 10 cm ; lamina in petiolum decurrens, elliptica vel obovato-elliptica, apiculata vel mucronata. Medius nervus in inferiore facie projectus. Nervii secundarii numerosi, paralleli. Inflorescentiae multiflorae, corymbiformes. Bractee ellipticae, concavae, \pm 7 mm longae, intus pilosae, margine irregulariter serrata, dentibus paucis et remotis. Flores 4-meri. Calyx 8-10 mm longus ; lobuli acuti vel subacuti, ad \pm 1/4 longitudinis calycis, intus omnino pilosi. Corolla tubo ad 10 cm longo ; lobuli oblongi, \pm 7 mm longi, obtusi. Stamina in margine tubi insertae, subsessiles ; antherae sagittatae. Ovarium biloculare, biovulatum, \pm 2,5 mm. Stigmata 2, linguiformia. Fructus globosus, paulo complanatus, \pm 15 mm diam., durus, bilocularis, biseminatus. Stipulae 2, in vagina connatae, subtriangulares, latae, longe aristatae, \pm 7 mm.

I. finlaysoniana proximus sed foliis major coriaceis et corollis valde longis, lobis crassioribus.

Typus : Madagascar, Sahatavy, Fénerive, leg. Botoalma 7002 RN, 30 I 1955 Herb. Mus. Parisiense.

Paratypi : Madagascar : 3918 RN ; 6894 RN ; SF 6564 ; SF 10737 ; SF 13576 ; SF 13691 ; SF 12911 ; SF 14242 ; SF 16236 ; SF 16239 ; SF 22346 Herb. Mus. Parisiense.

A SECOND SPECIES OF TETRACHYRON (ASTERACEAE-HELIANTHEAE)
FROM OAXACA, MEXICO

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In spite of a recent monographic study of Tetrachyron, a small Mexican genus with obscure relationships (Wussow and Urbatsch, 1979), two very distinct species have been discovered within the last two years (Turner, 1985; present paper), both from the Tehuantepec region of southwestern Oaxaca. This emphasizes the great need for additional botanical exploration of the more remote montane regions of Mexico.

Tetrachyron oaxacana B. L. Turner, sp. nov. Fig. 1.

Frutex caules glabri. Folia rhombico-ovata glabra, 3-5-nervia. Capitula 15-20, pedunculi 1-4 mm longi. Involucrum cylindricum, bracteae 5-6-seriatae, imbricatae, flavae, scariosae. Flores radii, 1-3, parvi pistillati fertiles; corollae aureae. Flores disci 5-6; corollae aureae. Achenia 4-angularia; pappus constans ex ca 12 squamis laceratis 0.6-1.0 mm longis.

Shrub to 1.5 m high. Stems terete, glabrous, reddish. Leaves opposite, glabrous, 6-8 cm long, 3-4 cm wide; petioles, 2.0-2.5 cm long, narrowly tapered (winged) from the blade; blade rhombic-ovate to rhombic-deltoid, minutely glandular-punctate, palmately 3-5 nerved, abruptly constricted below then gradually tapering along the petiole, the margins irregularly serrate, the apices acuminate. Heads 15-20 in terminal cymes 2-3 cm high, 2-3 cm wide, overtopped by the leaves, the ultimate peduncles 1-4 mm long. Involucre cylindric, 5-6 seriate, imbricate, 8-9 mm long, 3-4 mm wide; bracts scarious, yellowish, glabrous, 5-7 striate, ovate to elliptical with rounded or obtuse apices. Receptacular pales similar to the involucral bracts but thinner, with orange oil-ducts, the apices somewhat 3-lobed and lacerate. Ray florets 1-3 pistillate, fertile; corollas yellow, the tube glabrous, ca 3 mm long, the ligule 3-lobed, ca 4 mm long, ca 2 mm wide. Disk florets 5-6; corollas yellow, glabrous, ca 6 mm long, the tube ca 1.6 mm long, the lobes ca 1 mm long, prominently margined with orange oil-ducts. Anthers yellow, ca 2.5 mm long. Style branches obtuse or rounded, hispid on the undersurface just below the apex. Achenes (+ immature) of the ray and disk florets similar, 4-sided, ca 3 mm long, 0.7 mm wide, flecked with blackened cells; pappus of ca 12 lacerate scales 0.6-1.0 mm long.

TYPE: MEXICO. OAXACA: Cerro Guingola al SW de Tehuantepec, ca 1110 m, abundante en Suelo calizo rocoso, 27 Nov 1983, R. Torres C. 4202 (holotype, TEX; isotypes MEXU).

The generic placement of this species is moot. It was my original intention to treat this as a monotypic genus within the tribe Coreopsidae, a tribe to which I would also append Tetrachyron. Wussow and Urbatsch (1979), however, see no strong Coreopsid connection, in spite of their detection of anthochlors among the phenolics, plus several morphological features that suggest this tribe. In any case, Tetrachyron oaxacana is apparently a remote member within its genus and tends to obscure the taxonomic chasm between it and Calea. Indeed, I sent material to Dr. Urbatsch, who has worked on both Calea and Tetrachyron, and he kindly gave the following assessment (pers. comm.): the plant concerned has the capitulescence, phyllaries, and corollas of Tetrachyron but possesses the pappus and prismatic (?) achenes of Calea; vegetatively it is more like Tetrachyron. He concluded that the species here described "looks like a toss-up".

I tend to agree that it is somewhere between these two genera but believe that it is closer to Tetrachyron. If there is a Coreopsid connection it would appear to be remote and possible through the genus Goldmanella which has an involucre, achenes, corolla and style branches more or less similar to Tetrachyron oaxacana, but its leaves are alternate and without glandular punctations. It is interesting to note that Greenman, in his description of Goldmanella, states "The plant here described in the appearance of the involucre suggests some of the Galinsogaeae, particularly Calea..." I believe he was referring to the Tetrachyron group of that genus, prior to its segregation by Wussow and Urbatsch. Certainly the hypothetical Coreopsid-connection needs careful scrutiny, particularly if the tribe Coreopsidae is accepted in the broad sense of Turner and Powell (1977).

I am grateful to Dr. Lowell Urbatsch for his helpful comments on the taxon, to Dr. Guy Nesom for the Latin diagnosis and to Dr. L. Vorobik for the fine illustration.

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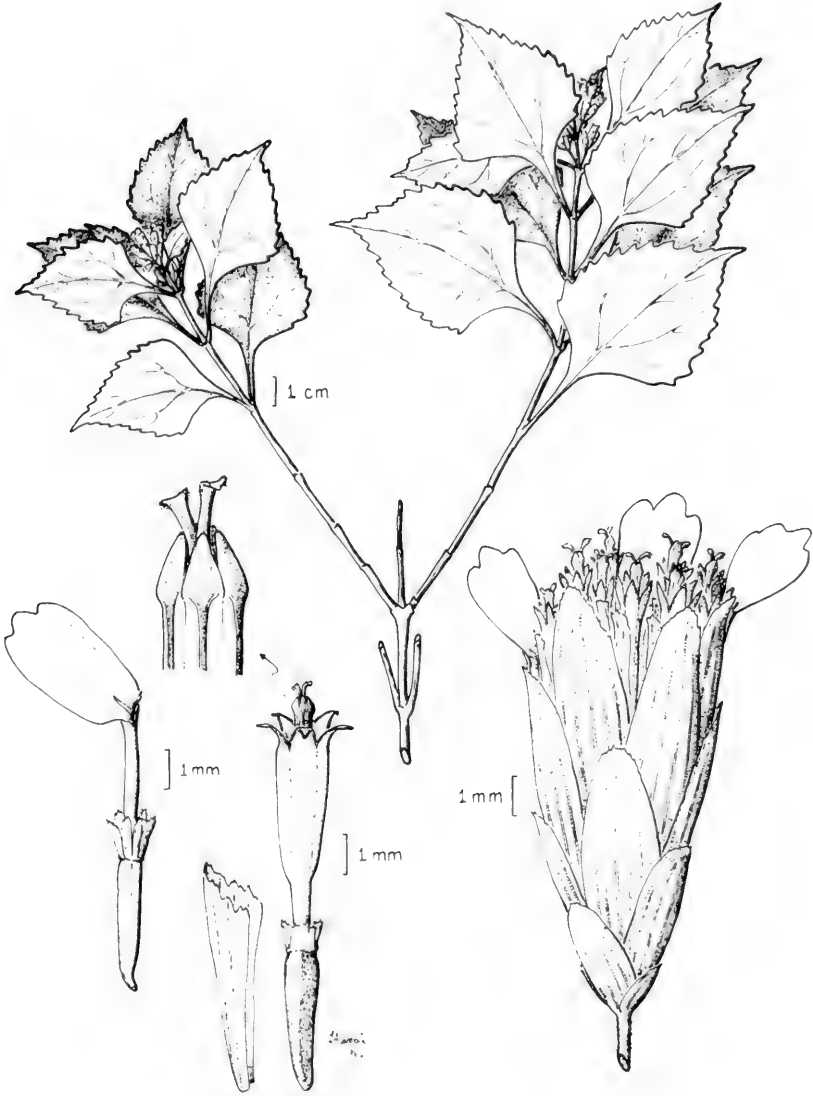


Fig. 1. TETRACHYRON OAXACANA, from holotype.

A NEW SPECIES OF VERBESINA (ASTERACEAE) FROM DURANGO, MEXICO

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Routine identification of plants from northwestern Mexico has revealed the following novelty. I am grateful to Dr. Guy Nesom for the Latin diagnosis.

VERBESINA DURANGENSIS B. L. Turner, sp. nov.

V. rosei aemulans, differt foliis paucioribus (3 paria) late ellipticis et acheniis sine pappo.

Perennial herb to 50 cm high, arising from a short woody rootstock, the root system fibrous. Stems terete, striate, sparsely strigose, prominently winged between the 3 leafy nodes, otherwise wingless. Leaves opposite, exactly 3 pairs, sessile, elliptic, 3-8 cm long, 2-4 cm wide, pinnately veined, and prominently reticulate, sparsely strigose on both surfaces the margins remotely denticulate, the apices obtuse. Heads borne 2-3 on elongate peduncles 20-30 cm long, the ultimate peduncles 5-8 cm long. Involucre campanulate, 2-3 seriate, ca 6 mm high and 8 mm wide (pressed), sparsely strigose; bracts subequal, mostly blackened, the outer series narrowly spatulate, the inner series linear-lanceolate. Receptacular pales ovate, black with yellow recurved apical cusps. Ray florets 8-13, neuter; corollas yellow, the tube ca 1 mm long, pubescent, the ligules 15-20 mm long, 3.0-4.5 mm wide. Disk florets 30-40; corollas yellow, ca 5 mm long, the tube ca 1 mm long, the lobes ca 1 mm long. Anthers black, ca 3 mm long, the appendages eglandular. Style branches with a short conical appendage, hispid beneath. Achenes (immature) ca 3 mm long, hispid, epappose.

TYPE: MEXICO. DURANGO: Mpio. de Mezquital, alrededores de La Guajolota, area de disturbio en bosque de pino, 16 Aug 1985, I. Solis 229 (TEX; isotypes to be distributed).

The species belongs to the section Pterophyton and is closely related to Verbesina rosei Rob. & Greenm. from Nayarit (lectotype GH!), but differs by its fewer, broadly elliptical, leaves and epappose achenes.

TRES ESPECIES NUEVAS DE Pinguicula (Lentibulariaceae)
DE MÉXICO*

Sergio Zamudio Ruiz**

y

Jerzy Rzedowski***

RESUMEN

Se describen tres especies nuevas de Pinguicula (Lentibulariaceae) de México: P. barbata (Subg. Temnoceras) de Chiapas, P. emarginata (Subg. Temnoceras) de Veracruz y Puebla y P. takakii (Subg. Isoloba) de San Luis Potosí.

ABSTRACT

Three new species of Pinguicula (Lentibulariaceae) are described from México: P. barbata (Subg. Temnoceras) from Chiapas, P. emarginata (Subg. Temnoceras) from Veracruz and Puebla and P. takakii (Subg. Isoloba) from San Luis Potosí.

La revisión de los especímenes del género Pinguicula depositados en los herbarios mexicanos ha revelado la existencia de varios taxa nuevos. En este trabajo se describen tres nuevas especies endémicas de México; de ellas P. barbata descrita de ejemplares provenientes de Chiapas y P. emarginata, conocida de Veracruz y Puebla se ubican en el Subgénero Temnoceras Barnh. emend. Casper (1966), la tercer especie P. takakii, colectada en San Luis Potosí pertenece al Subgénero Isoloba.

La descripción de estos taxa aumenta a 17 la lista de especies de Pinguicula conocidas hasta ahora de México; la existencia de otros ejemplares de herbario (actualmente en estudio) que no coinciden con ninguna de las especies conocidas, indica la necesidad de incrementar las colectas en todo el territorio del país y hacer una revisión a fondo de este género en México.

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Pinguicula barbata sp. n.: Herba perennis. Folia 11-17, obovato-spathulata, 27-42 mm longa, 17-26 mm lata, a supra medium basin versus abrupte cuneata; rosula "hiemalis" destituta. Pedicelli 1-5, 33-70 mm longi. Flores 12-16 mm longi (calcare incluso). Calyx bilabiatus; labium superum usque ad basin fere divisum, lobis oblongo-lanceolatis, 2.5-3 mm longis, +1 mm latis; labium inferum usque ad tertium vel dimidium bilobatum, lobis lanceolatis, 1.5-1.6 mm longis, 0.8-0.9 mm latis. Corolla bilabiata, pallide violacea ("pale lavender" fide Breedlove & Smith); labium superum bilobatum, infero manifeste brevius, lobis ellipticis, +4 mm longis, 3-3.5 mm latis; labium inferum trilobatum, pilis glandulosis tortis, multicellularibus et apice multiseriatis, in lineas tribus dispositis, barbatum, lobis inaequalibus, medio majore, hemicirculari, 5-7 mm longo, 4.5-6.2 mm lato, lateralibus obovatis usque ad oblongis, 3-5 mm longis, 3-4.5 mm latis; tubus brevissimus, cylindricus, +2 mm longus, +6 mm latus, infra labium superum geniculatus; palatum nullum; calcar cylindricum, 3.8-4 mm longum, +1 mm latum, angulum obtusum formans. Capsula subglobosa, 2-3 mm diametro.

Hierba perenne. Hojas numerosas (11-17), obovado espatuladas, de 27 a 42 mm de largo por 17 a 26 mm de ancho, ápice redondeado, base abruptamente cuneada desde más arriba de la parte media, margen entero e involuto, con numerosas glándulas estipitadas y glándulas sésiles punteadas dispersas en el haz. No presenta roseta de invierno. Pedicelos 1 a 5 por planta, erectos, filiformes, de 33 a 70 mm de largo, densamente glanduloso pubescentes, unifloros. Flores de 12 a 16 mm de largo por 8 a 9 mm de ancho; cáliz bilabiado, provisto por fuera de glándulas estipitadas dispersas, labio superior dividido en tres lóbulos oblongo-lanceolados, de 2.5 a 3 mm de largo por 1 mm de ancho, separados casi hasta la base, labio inferior dividido de 1/3 a 1/2 de su longitud en dos lóbulos lanceolados, de 1.5 a 1.6 mm de largo por 0.8 a 0.9 mm de ancho, corola bilabiada de color violáceo pálido (pale lavender fide Breedlove & Smith), labio superior notoriamente más corto que el labio inferior, dividido en dos lóbulos elípticos, de +4 mm de largo por 3 a 3.5 mm de ancho, labio inferior dividido en tres lóbulos desiguales, el medio más grande, hemicircular, de 5 a 7 mm de largo por 4.5 a 6.2 mm de ancho, los laterales obovados a oblongos con el ápice truncado, de 3 a 5 mm de largo por 3 a 4.5 mm de ancho, barbado con tres líneas de pelos glandulares retorcidos, multicelulares, multiseriados en el ápice, que se extienden de la base de los lóbulos hasta el tubo, tubo muy corto, cilíndrico, geniculado abajo del labio superior, de +2 mm de largo por +6 mm de ancho, con escasas glándulas estipitadas en su exterior, paladar ausente, espón cilíndrico, formando ángulo obtuso con respecto al resto de la corola, de 3.8 a 4 mm de largo por +1 mm de ancho, con glándulas estipitadas dispersas en su exterior, estambres geniculados, de 1.5 a 2 mm de largo, anteras reniformes, de 0.5 a 0.8 mm de largo, ovario hemisférico, estigma bilobado, el lóbulo inferior agrandado,

hemicircular, laciniado, de +2 mm de largo por +1 mm de ancho. Cápsula subglobosa, de 2 a 3 mm de diámetro, con glándulas estipitadas dispersas. Semillas numerosas, obovoides, de +1 mm de largo por 0.3 a 0.5 mm de ancho, superficie granulosa.

TIPO: México, Chiapas, 10 km al E. de El Porvenir, a lo largo del camino a Huixtla-Siltepec, Municipio de La Grandeza, alt. 2900 m, 18-I-1973, D.E. Breedlove & A.R. Smith 31833 (MEXU).

Sólo conocida de la colecta anterior.

Esta especie se ubica en el Subgénero Tennoceras Barnh. emend. Casper (1966), por tener hojas uniformes en un solo tipo de roseta, la corola bilabiada con el labio inferior mucho más grande que el labio superior, el lóbulo medio del labio inferior más grande que los laterales, el tubo corto, cilíndrico, los pelos del interior de la corola ordenados en tres líneas y el espón cilíndrico (Fig. 1). De este subgénero, hasta ahora, sólo se conocía en México a Pinguicula crenatiloba DC.

Por la forma de la corola tiene cierto parecido con Pinguicula variegata Turcz., de la parte oriental de Siberia Septentrional en Rusia y en menor grado con algunas especies sudamericanas.

De la especie anterior P. barbata se diferencia por muchas características, las más importantes se muestran a continuación:

	<u>P. barbata</u>	<u>P. variegata</u>
Tamaño de la hoja		
Largo X Ancho	27-42 mm X 17-26 mm	6-9 mm X 5-7 mm
Largo del pedicelo	33-70 mm	45-130 mm
Largo de las flores	12-16 mm	8-17 mm
Color de la corola	Violáceo pálido	Variegado: blanquecino amarillo, azul, con estrias violáceas
Forma del tubo	Cilíndrico geniculado	Cónico infundibuliforme
Cápsula	Subglobosa	Ovoide o retusa
Pelos del interior	Retorcidos, multicelulares, multiseriados en el ápice	Multicelulares cilíndricos

Destaca por sus hojas más grandes, por sus flores de color violáceo pálido con los lóbulos del labio superior de la corola más grandes y de forma elíptica, el tubo cilíndrico geniculado abajo del labio superior y sobre todo por la pubescencia de la parte interna del tubo formada por pelos retorcidos, multicelulares, subulados y multiseriados en el ápice.

Pinquicula emarginata sp. n.: Herba perennis. Folia 5-16, elliptica vel obovata, breviter petiolata, 10-50 mm longa, (3) 5-22 mm lata, basi cuneata, margine integra et involuta; rosula "hiemalis" destituta. Pedicelli 1-7, 40-100 mm longi, uniflori. Flores (8) 10-16.5 mm longi (calcare incluso). Calyx bilabiatus; labium superum usque ad basim fere divisum, lobis oblongis usque ad oblongo-lanceolatis, 1.6-2.5 mm longis, 0.5-0.8 mm latis, labium inferum usque ad $2/3$ longitudinis bilobatum, lobis oblongis usque ad oblongo-lanceolatis, 1.5-2 mm longis, 0.3-0.7 mm latis, lobis aliquis apice leviter fissis vel omnino partitis. Corolla bilabiata, alba venis purpureis (lutea fide García Saucedo), labium superum infero brevius, bilobatum, lobis late oblongis usque ad subquadratis, 2-4 mm longis et latis, irregulariter emarginatis vel fissis; labium inferum trilobatum, lobis spatulatis usque ad obovatis, 3.6-6.2 mm longis, 2-5 mm latis, apice truncatis, irregulariter fissis vel emarginatis; tubus campanulatus usque ad late infundibuliformis, (1) 2-4 mm longus, 3-5 mm latus, intus pilis multicellularibus subulatis abundantibus, sub forma brevior secus calcar penetrantibus; palatum nullum; calcar subulatum, rectum vel leviter curvatum, 4-7 mm longum, 0.5-1 mm latum. Stamina 1-1.8 mm longa. Capsula subglobosa, (1.5) 2-2.5 mm longa, 1.2-2 mm lata.

Hierba perenne. Hojas 5 a 16, elípticas u obovadas, de 10 a 50 mm de largo por (3) 5 a 22 mm de ancho, con peciolo cortos, el ápice redondeado y la base cuneada, margen entero e involuto, con glándulas estipitadas y glándulas sésiles dispersas en la superficie superior. No presenta roseta de invierno. Pedicelos 1 a 7 por planta, erectos, filiformes, de 40 a 100 mm de largo, glabros en la base, con glándulas estipitadas dispersas cerca de la punta, unifloros. Flores de (8) 10 a 16.5 mm de largo (incluyendo el espolón) por (6) 8 a 13 mm de ancho; cáliz bilabiado, con pocas glándulas estipitadas y glándulas sésiles dispersas en su superficie externa, el labio superior dividido en tres lóbulos oblongos a oblongo-lanceolados, libres casi hasta la base, de (1) 1.6 a 2.5 mm de largo por 0.5 a 0.8 mm de ancho, labio inferior dividido hasta $2/3$ de su longitud en dos lóbulos oblongos a oblongo-lanceolados, de 1.5 a 2 mm de largo por 0.3 a 0.7 mm de ancho, algunos lóbulos están ligeramente hendidos en el ápice y se subdividen parcial o totalmente formando cálices con 6 ó 7 lóbulos; corola bilabiada, de color blanco con venas moradas (amarillo fide García Saucedo), labio superior más corto que el inferior, dividido

en dos lóbulos ampliamente oblongos o semicuadrados, de 2 a 4 mm de largo y ancho, con el ápice irregularmente emarginado o hendido, labio inferior dividido en tres lóbulos espatulados a obovados, de 3.3 a 6.2 mm de largo por 2 a 5 mm de ancho, con el ápice truncado, irregularmente hendido o emarginado, tubo muy corto, campanulado o ampliamente infundibuliforme, de (1) 2 a 4 mm de largo por 3 a 5 mm de ancho, con escasas glándulas estipitadas en la base en la parte externa, con abundantes pelos glandulares multicelulares subulados en la parte interna, mismos que penetran a lo largo del espolón, en donde disminuyen de tamaño, paladar ausente, espolón subulado, derecho o ligeramente curvo, surgiendo como prolongación recta del tubo de la corola, con glándulas estipitadas dispersas en su parte externa, de 4 a 7 mm de largo por 0.5 a 1 mm de ancho; estambres geniculados, de 1 a 1.8 mm de largo por 0.3 a 0.5 mm de ancho, anteras transversalmente elípticas o transversalmente oblongas; ovario hemisférico, con pelos glandulares dispersos, estigma bilobado, con el lóbulo inferior agrandado, de forma hemicircular, de +1 mm de largo por 1 a 2 mm de ancho, con la cara interna papilosa, la cara externa glabra. Cápsula subglobosa, de (1.5) 2 a 2.5 mm de largo por 1.2 a 2 mm de ancho. Semillas numerosas, angostamente obovoides, mucronadas, con el funículo persistente en la base, de +1 mm de largo por 0.2 a 0.3 mm de ancho, la superficie es reticulada con celdas hexangulares.

TIPO: México, Veracruz, Municipio de Atzalan, Tatzayanala, orilla del río, sobre peñas, alt. 1400 m, 10-I-1970, F. Ventura A. 347 (ENCB).

Material adicional examinado: Puebla, Cascada Oligui, entre Teziutlán y Tlapacoyan, orillas de río en bosque de neblina, alt. 1550 m, 2-VI-1968, D. García Saucedo 79 (ENCB).

Esta especie también se ubica en el subgénero Temnoceras Barnh. emend. Casper (1966) y dentro de las especies mexicanas se encuentra cercana a Pinguicula crenatiloba DC., por la corola bilabiada, con el labio inferior más grande que el superior, los lóbulos de la corola irregularmente hendidos o emarginados (Fig. 2), pero difiere en su tamaño y en la forma de algunas estructuras, como se muestra a continuación:

	<u>P. emarginata</u>	<u>P. crenatiloba</u>
Largo de la hoja	10-50 mm	(5) 8-12 (14) mm
Ancho de la hoja	(3) 5-22 mm	3-7 mm
Largo del pedicelo	40-100 mm	(15) 25-45 (72) mm

	<u>P. emarginata</u>	<u>P. crenatiloba</u>
Largo de la flor	(8) 10-16 mm	(3) 5-6 (7)
Forma del tubo	Campanulado a ampliamente infundibuliforme	Cilíndrico
Largo del tubo	2-4 mm	1 mm
Forma del espolón	Subulado	Cilíndrico con el ápice cónico
Largo del espolón	7-14 mm	1.5-2.5 mm

Existen otras características que las distinguen, pero es fácil diferenciarlas por el mayor tamaño de P. emarginata y por la forma de los lóbulos de la corola, además, P. crenatiloba tiene paladar y pelos claviformes multiseriados en el ápice, estructuras que no se presentan en P. emarginata.

Pinguicula takakii sp. n.: Herba perennis. Folia 3-8, breviter spatulata vel obovata, 5-16 mm longa, 4-12 mm lata, a supra medium basim versus abrupte cuneata, margine integra et involuta; rosula "hiemalis" destituta. Pedicelli 1-5, atrorubri, 25-26 mm longi, uniflori. Flores 6-12 (14) mm longi (calcare incluso). Calyx atroruber, bilabiatus; labium superum usque ad 2/3-3/4 longitudinis trilobatus; lobis oblongo-triangularibus, obtusis vel acutis, 0.8-1.4 mm longis, 0.4-0.7 mm latis; labium inferum bilobatum usque ad 1/4-1/2 longitudinis, lobis triangularibus, acutis, 0.3-0.7 mm longis, 0.3-0.5 mm latis. Corolla subisoloba, violacea, tubi parte infera et calcare luteis, faucibus luteis sed parte infera lineis atrorubris +sex, lobi breviter spatulati vel obovati usque ad subquadrati, apice rotundati vel truncati, breviter emarginati vel leviter undulati, 2-3 mm longi et lati; palatum semilenticiforme, 0.6-1.3 mm longum, 0.6-2 mm latum, leviter emarginatum, luteum, dense pilosum, pilis multicellularibus claviformibus; tubus subcylindricus, 4-5 mm longus, 3-4 mm latus, intus pilis multicellularibus subulatis, aliquis ramosis; calcar cylindricum, 2-3.5 mm longum, 0.8-1 mm latum, angulum obtusum formans. Stamina 1-1.2 mm longa. Capsula subglobosa, 1.2-2 mm diametro. Semina numerosa.

Hierba perenne. Rizomas simples, raicillas adventicias filamentosas (4 a 12). Hojas 3 a 8, cortamente espatuladas u obovadas, de 5 a 16 mm de largo por 4 a 12 mm de ancho, ápice redondeado, base abruptamente cuneada desde la mitad o más arriba, margen entero e involuto, con numerosas glándulas estipitadas y sésiles dispersas en el haz. No presenta roseta de invierno. Fedicelos 1

a 5 por planta, de color guinda, filiformes, de 25 a 65 mm de largo, con glándulas estipitadas de color guinda dispersas, unifloras. Flores de 6 a 12 (14) mm de largo (incluyendo el espolón), por 4 a 10 mm de ancho; cáliz guinda, bilabiado, con glándulas estipitadas y sésiles dispersas en la superficie exterior, el labio superior dividido de 2/3 a 3/4 partes de su longitud en tres lóbulos, oblongo triangulares, obtusos a agudos, de 0.8 a 1.4 mm de largo por 0.4 a 0.7 mm de ancho, el labio inferior dividido de 1/4 a 1/2 de su longitud en dos lóbulos, triangulares, agudos, de 0.3 a 0.7 mm de largo por 0.3 a 0.5 mm de ancho; corola subisoloba, de color violeta con la parte inferior del tubo y el espolón amarillos, la garganta amarilla con +6 líneas de color guinda en la parte inferior, glabra por fuera, lóbulos subiguales, cortamente espatulados, obovados a subcuadrados, con el ápice redondeado o truncado, ligeramente emarginado o crenado, de 2 a 3 mm de largo por 2 a 3.1 mm de ancho, paladar semilentiforme, de 0.6 a 1.3 mm de largo por 0.6 a 2 mm de ancho, ligeramente emarginado, de color amarillo, cubierto por numerosos pelos multicelulares claviformes, tubo subcilíndrico de 4 a 5 mm de largo por 3 a 4 mm de ancho, con pelos multicelulares subulados, algunos con prolongaciones o ramificaciones laterales; espolón cilíndrico, de 2 a 3.5 mm de largo por 0.8 a 1 mm de ancho, con glándulas estipitadas esparcidas en su parte externa, forma un ángulo obtuso con respecto de la corola; estambres de 1 a 1.2 mm de largo; ovario hemisférico, con glándulas estipitadas dispersas, estigma bilobado, con el lóbulo inferior agrandado, de forma hemicircular, con pelos retrorsos en la cara externa y papilas en la cara interna, de +1.1 mm de largo por +1 mm de ancho, de color guinda. Cápsula subglóbosa, de 1.2 a 2 mm de diámetro. Semillas numerosas, obovoides a elipsoidales, de 0.4 a 0.5 mm de largo por 0.2 a 0.3 mm de ancho, la superficie reticulada con celdas más o menos hexagonales.

TIPO: México, San Luis Potosí, Municipio de Villa Juárez, Minas de Guascaná, 2 km al S.E. de Buenavista, ladera yesosa con matorral desértico rosetófilo de Hechtia sp., Agave striata, Dasyli-
rion longissimum y Dodonaea viscosa, alt. 1400 m, 18-XII-1980, S. Zamudio R. 3789 (ENCB).

Material adicional revisado: San Luis Potosí, Municipio de Villa Juárez, Minas de San Rafael y Guaxcamá, ladera yesosa con matorral rosetófilo de Hechtia glomerata, Agave striata, Dasyli-
rion longissimum, alt. 1350 m, 30-XI-1965, F. Takaki 2507 (ENCB); 1.5 km al N.E. de Buenavista, alt. 1350 m, 20-XII-1980, S. Zamudio R. 3824 (ENCB).

Esta especie se ubica dentro del subgénero Isoloba, Sección Isoloba de Casper (1963), que se caracteriza por tener hojas uniformes, los lóbulos de la corola casi iguales, el tubo cilíndrico, presencia de paladar y espolón corto (Fig. 3).

P. takakii es muy parecida a P. lilacina Schlecht. & Cham. y a P. sharpii Casper et Kondo, pero se diferencia de ellas (Cuadro 1), por sus hojas (5 a 16 mm de largo) cortamente espatuladas u obovadas con la base abruptamente cuneada desde más arriba de la mitad, que en general son más chicas que las hojas redondeado ovadas u obovadas de base cuneada ((15) 20-35 (45) mm de largo) de P. lilacina y las ampliamente obovadas con base cuneada (14-18.5 mm) de P. sharpii.

El pedicelo y el cáliz de color guinda la distingue de las otras especies en las que estas partes son amarillas o amarillo-verdosas. Las flores son más cortas que las de P. lilacina y casi iguales o a veces más grandes que las de P. sharpii.

La pubescencia del interior de la corola también es distinta: P. takakii y P. sharpii tienen pelos multicelulares claviformes en el paladar, más cortos y subulados en el tubo, en donde algunos muestran prolongaciones laterales, en P. lilacina los pelos del paladar son más largos, clavado-capitados y multiseriados en el ápice.

Finalmente el habitat las separa de manera notable, ya que P. lilacina y P. sharpii crecen sobre rocas, en bordos o taludes de los bosques de encino, pino encino, o bosques mesófilos de montaña, en ambientes de clima semihúmedo o húmedo, mientras que P. takakii crece sobre suelo yesoso asociada con Selaginella sp. y P. gypsicola Brandegees en laderas secas con matorral desértico rosetófilo de Hechtia glomerata, Agave striata y Dasyllirion longissimum.

El nombre de la especie se dedica al Biólogo Francisco Takaki, quien fue aparentemente el primero en coleccionar ejemplares de esta planta. El Biól. Takaki es ampliamente conocido en el medio botánico mexicano por su contribución a la cartografía de la vegetación del país.

AGRADECIMIENTOS

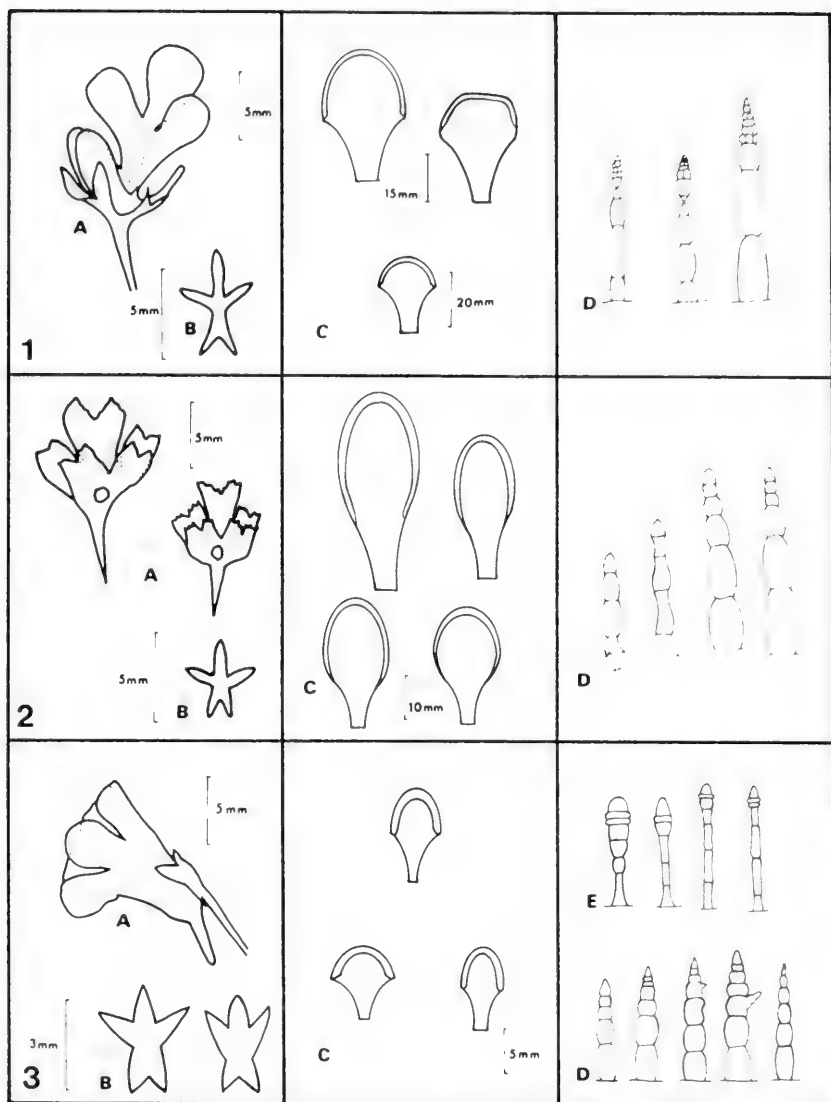
Se agradece a la Profesora Luz Ma. Villarreal de Puga, Directora del Instituto de Botánica de la Universidad de Guadalajara, su apoyo para la realización de este trabajo. Se dan las gracias asimismo a las autoridades de los herbarios MEXU y ENCB por el préstamo de sus materiales de Pinguicula.

LITERATURA CITADA

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Cuadro. 1 Diferencias en algunas estructuras entre *P. takakii*,
P. lilacina y *P. sharpii*

CARACTERÍSTICAS	<u><i>Pinguicula takakii</i></u>	<u><i>Pinguicula lilacina</i></u>	<u><i>Pinguicula sharpii</i></u>
Forma de la hoja	Cortamente espatulada o obovada, base abruptamente cuneada	Redondeada-ovada, obovada, base cuneada angosta	Más o menos ampliamente obovada, base cuneada, angosta
Largo de la hoja	6-16 mm	(15) 20-35 (45) mm	14-18 mm
Ancho de la hoja	4-12 mm	(9) 12-17 (23) mm	11-17 mm
Largo del pedicelo	20-65 mm	(30) 50-120 (170) mm	13.4-39.5 mm
Largo de la flor	6-12 (14) mm	(8) 10-15 (17) mm	3-9 mm
Lóbulos del labio superior del cáliz	Oblongo triangulares, obtusos a agudos, unidos 1/4 a 1/3 de su longitud	Oblongo obtusos a agudos, unidos 2/3 de su longitud	Oblongos obtusos a agudos, libres casi hasta la base
Lóbulos del labio inferior del cáliz	Triangulares, obtusos a agudos, unidos 1/2 a 3/4 de su longitud	Ovado lanceolados, agudos, unidos 1/2 de su longitud	Oblongo agudo, unidos 1/3 a 1/2 de su longitud
Color de la corola	Violeta con la parte inferior del tubo y el espolón amarillos, la garganta amarilla con seis líneas quinadas	Lila blanquecina-lila, azul pálido o blanquecina con la garganta amarilla	Lóbulos blanquecinos, garganta amarilla, tubo amarillo con estrias violáceas
Pubescencia de la corola	Pelos multicelulares, claviformes en el paladar, más cortos y subulados en el tubo, algunos con prolongaciones laterales	Pelos alargados, multicelulares clavado-capitados, multiseriados en el ápice	Pelos multicelulares claviformes en el paladar, más cortos y subulados en el tubo, algunos con prolongaciones laterales



Representación esquemática de: 1. *Pinquicula barbata*, 2. *Pinquicula emarginata* y 3. *Pinquicula takakii*. A. flor, B. cáliz, C. hojas, D. pelos del interior de la corola, E. pelos del paladar.

NOTES ON THE GENUS CLERODENDRUM (VERBENACEAE). XX

Harold N. Moldenke

CLERODENDRUM HOLTZEI F. Muell.

Additional bibliography: Mold., Phytologia 60: 200. 1986.

Continuation of description of the species: "style glabrous, almost totally enclosed; fruit shorter than the calyx; pericarp thin, somewhat succulent; endosperm thinly osseous, often only one of the nutlets perfect. In clefts of rocks, the comparatively long carnulent root deeply penetrating. Stems seemingly but slightly woody, often only a foot long even when flowering, slender. Leaves mostly measuring 1--1½ inches, exceptionally somewhat indented, never pointed. Calyx occasionally 6 cleft. Corolla measuring ½--2/3 inch in length. Nutlets ½--1/3 inch long, when solitary verging into a globular form. Testa pale. Cotyledons white, turgid; radicle very short. This species is as regards its flowers not unlike *C. tomentosum* but the stamens are shorter, and the leaves as well as the stature and the fruit are widely different; in size of the leaves it comes near to *C. phlomoides*."

Citations: AUSTRALIA: Northern Territory: *Holtze 109* [Herb. Praeger 18685] (Ca--isotype, Gg--32012--isotype, L--isotype).

CLERODENDRUM HORSFIELDII Miq., Fl. Ind. Bat. 2: 880--881 [as "*Clerodendron*"]. 1858; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 64 & 90. 1942.

Synonymy: *Clerodendron horsfieldii* Miq., Fl. Ind. Bat. 2: 880--881. 1858. *Clerodendron blumeianum* var. *horsfieldii* (Miq.) Kuntze, in herb.

Bibliography: Miq., Fl. Ind. Bat. 2: 880--881. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; Koord. & Valet., Meded. Lands Plant. Bat. 42 [Beijdr. Booms. Java 7]: 212. 1900; Koord. Exkursionsfl. 3: 138. 1912; H. J. Lam, Verbenac. Malay. Arch. 304 & 363. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 92, 109, & ix. 1921; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 64 & 90. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561. 1946; H. N. & A. L. Mold., Pl. Life 2: 65. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 144 & 181. 1949; Syngé in Chittenden, Roy. Hort. Soc. Dict. Gard., ed. 2, 1: 505. 1956; Mold., Résumé 190, 264, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561. 1960; Mold., Fifth Summ. 1: 322 & 446 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 313 & 537. 1980; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 446. 1983; Mold., Phytologia 58: 196, 197, 287, & 291 (1985) and 59: 331. 1986.

Miquel's original (1858) description of this plant is "Ramuli obtuse subcompresso-tetragoni petiolique cum foliis paginâ sup. et inflorescentiâ puberuli. folia opposita aequalia vel inaequalia longe (6--3 poll.) petiolata, e basi lato-cordata vel subconcapâ rotundato-ovata acuminata repando-obtuse subcalloso-denticulata, subcoriacea, subtus molliter breviterque cana et raris glandulis peltatis

inspersa alte trinervia et pauci-costata transverseque venosa, 7--2 poll. longa, cymae longe pedunculatae in thyrsus corymbosum parvipaucique foliatum collectae, singulae vulgo 7--4-florae, calycis puberuli colorati (in sicco coccinei) campanulati sub anthesi semipollice parum brevioris 5-fidi laciniae elliptico-oblongae acutatae pauci-glandulosae, corollae extus tenuissime puberae tubus pollicaris calyce circiter triplo longior, limbi 5-partiti laciniae obovato-oblongae subspathulatae 6--5 lin longae unilaterae, staminibus paullo breviores, stigmatis crura acuta inaequalis. Java, op den G. Prae (Horsf.). -- Kembang geni sund."

A key to distinguish this species from its relatives in cultivation in English gardens, as given (with modifications) by Syngé (1956), may be found under *C. bethunianum* Low in the present series of notes (58: 197).

Material of this species has been misidentified and distributed in some herbaria as *C. speciosissimum* Van Geert. On the other hand, the *Ploem* 155, distributed as *C. horsfieldii*, actually is *C. disparifolium* Blume.

Citations: GREATER SUNDA ISLANDS: Java: *Backer* 30604 (Bz--20512, Bz--20513, Bz--20514); *Horsfield* s.n. (Ld--photo of type, N--photo of type, Ut--49915--type).

CLERODENDRUM HUMBERTI Mold., *Phytologia* 3: 307--308. 1950.

Synonymy: *Clerodendrum humbertii* Moldenke apud Fosb., *Kew Bull.* 33: 143. 1978.

Bibliography: Mold., *Phytologia* 3: 307--308. 1950; E. J. Salisb., *Ind. Kew. Suppl.* 11: 56. 1953; Mold. in *Humbert, Fl. Madag.* 174: 150, 187. 191, & 267, fig. 30 (12 & 13). 1956; Mold., *Résumé* 155 & 450. 1959; Mold., *Fifth Summ.* 1: 260 (1971) and 2: 866. 1971; Fosb., *Kew Bull.* 33: 143. 1978; Mold., *Phytol. Mem.* 2: 249 & 537. 1980; Mold., *Phytologia* 58: 187 (1985) abd 59: 497. 1986.

Illustrations: Mold. in *Humbert, Fl. Madag.* 174: 187, fig. 30 (12 & 13). 1956.

A twiggy shrub, about 1 m. tall; branches, branchlets, and twigs numerous, slender, light-gray or whitish, subterete, densely white-strigose with short, closely appressed, antrorse hairs, the branches less densely strigose in age, finally glabrescent on old wood; nodes not annulate; principal internodes 1.3--4 cm. long; leaves very small, decussate-opposite, regular, apparently quite uniform; petioles filiform, 2--6 mm. long, rather densely appressed-strigillose with whitish hairs; leaf-blades firmly chartaceous, perhaps somewhat fleshy when fresh, uniformly bright-green on both surfaces or slightly lighter beneath, orbicular, 5--13 mm. long and wide, apically rounded or emarginate, marginally entire, basally rounded or truncate, glabrous on both surfaces, very densely impressed-punctate on both surfaces, the midrib and approximately 4 secondaries filiform, very tenuous, indiscernible on both surfaces or very obscure beneath; veinlet reticulation indiscernible on both surfaces; inflorescence terminal and in the uppermost leaf-axils, small. cymose, the individual cymes lax, 1.5--3 cm. long and wide, rather few-flowered; peduncles very slender, very densely white-strigose like the twigs,

6--10 mm. long; pedicels filiform, 3.5--6 mm. long, scattered-strigillose with white hairs; calyx campanulate, about 2 mm. long and wide, very sparsely scattered-strigillose with very short white hairs, the rim very shallowly and obscurely 5-toothed or subtruncate; corolla hypocrateriform, pale greenish-white or white, the tube about 5 mm. long, externally puberulent, the limb about 5 mm. wide; stamens and pistil long-exserted, the latter about 11 mm. long, glabrous; stigma bifid.

This endemic species is based on *Humbert & Swingle 5623* from the neighborhood of Ambovombe, at 1--50 m. altitude, in the extreme south of Madagascar, collected on September 9, 1928, and deposited in the United States National Herbarium in Washington.

Fosberg (1978) suggests that this species may "represent" *C. glabrum* E. Mey. in Madagascar, "which seems similar in many respects".

Collectors have encountered *C. humberti* in sand along roadsides and in *Didierea* bushland, at 1--50 m. altitude, in flower in May, July, September, and November. The corollas are described as having been "white" on *Decary 2690, 2771, 9077, & 9169* and *Lam & Meeuse 5488*.

A key to distinguish this species from its Madagascar relatives will be found under *C. baronianum* Oliv. in the present series of notes (58: 184--190).

Citations: MADAGASCAR: *Decary 2690* (P), *2771* (N, P), *9077* (P), *9169* (P); *Humbert & Swingle 5623* (A--isotype, F--photo of type, It--photo of type, Ld--photo of type, N--fragment of type, N--photo of type, P--isotype, W--1528818--type); *Lam & Meeuse 5488* (Le--939171-384, N).

CLERODENDRUM HUMILE Chiov., Nuov. Giorn. Bot. Ital., ser. 2, 29: 117 [as "*Clerodendron*"]. 1923; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 64 & 93. 1936.

Synonymy: *Clerodendron humile* Chiov., Nuov. Giorn. Bot. Ital., ser. 2, 29: 117. 1923.

Bibliography: Chiov., Nuov. Giorn. Bot. Ital., ser. 2, 29: 117. 1923; A. W. Hill, Ind. Kew. Suppl. 7: 51. 1929; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 37, 64, & 93. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 48 & 90 (1942) and ed. 2, 115 & 181. 1949; Mold., Resumé 141 & 450. 1959; Mold., Fifth Summ. 1: 228 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 218 & 538. 1980.

This species is based on an unnumbered Bovone collection from the Katanga Plateau of the Bionos, Zaire, collected on October 19 (year?) and according to Thomas (1936) the plant is only 12--15 cm. tall, the leaves at most 5 cm. long and 2.5 cm. wide, and the corolla-tube about 5 cm. long. He comments that "Diese Art ist mir nur aus der Beschreibung bekannt; danach dürfte sie mit *C. buchneri* identisch sein, von der sie ein zufällig sehr kleines Exemplar darstellt; sie unterscheidet sich lediglich durch die Grössenverhältnisse". In his key to species he distinguishes *C. buchneri* from it by the fact that in *C. buchneri* the plants are to 60 cm. tall and the corolla-tubes about 9 cm. long.

Nothing is known to me of *C. humile* beyond what is stated in its

meager bibliography (above).

CLERODENDRUM IMPENSUM Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 100. 1936.

Bibliography: B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 7, 38, 66, 94, & 100. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 49 & 90. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 55. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 116, 118, & 181. 1949; Mold., Résumé 144 & 450. 1959; Mold., Fifth Summ. 1: 235 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 225 & 538. 1980.

A shrub, 1--2 m. tall; branchlets obtusely tetragonal, dark rusty-red, hollow, puberulent or hispidulous, with accessory buds; leaves decussate-opposite; petioles 0.5--2 cm. long, hispidulous ["vel cuspidato" fide Thomas, =hispid?], striate; leaf-blades coriaceous, elliptic-oblong, 6--9 cm. long, 4--5 cm. wide, apically acute, marginally coarsely and irregularly dentate or undulate, basally attenuate, glabrous above or sparsely pilose on the immersed venation, prominently "cuspidata" [fide Thomas, =hispid?] on the venation beneath; inflorescence capitate, few-flowered, borne in the axils of small leaves or foliaceous bracts and aggregate at the tips of the branchlets; peduncles very short; pedicels very short; bracts rotund-elliptic or lanceolate-elliptic, 0.6--2 cm. long, 0.3--1.5 cm. wide, apically acute, conspicuously venose, glabrous, marginally ciliate, probably colored; calyx probably violet in color, cupuliform-campanulate, 3 mm. long and about equally wide, basally sparsely hispid; corolla white, the tube slender, about 3.5 cm. long, curved, glandulose, basally and apically slightly dilated, the lobes 5, subequal, ovate-oblong, about 6 mm. long, reclinate; stamens long-exserted, the filaments didynamous, 5.5 and 6 cm. long, inserted below the mouth of the corolla-tube, surpassing the pistil; anthers 1.5 mm. long; style 5.6 cm. long; stigma shortly bifid; fruiting-calyx about 1 cm. long, wide-spreading, split to 4/5 its length into 5 ovate-triangular teeth which are basally 4 mm. wide, apically acute, marginally ciliate, and conspicuously venose; mature fruit unknown.

This species is based on *Eick* 396 from an abandoned cultivated area at Usambara, Kwai, Tanganyika, collected on October 22, 1899, and deposited in the Berlin herbarium, now probably destroyed.

Thomas (1936) cites also *Albers* 248 and *Engler* 1175 from the same locality in Tanganyika, the altitude there given as 1500--1600 m.

Nothing further is known to me of this species.

CLERODENDRUM IMPENSUM var. *BUCHNEROIDES* Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 66. 1936.

Bibliography: B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 66. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 49 & 90 (1942) and ed. 2, 116 & 181. 1949; Mold., Résumé 144 & 450. 1959; Mold., Fifth Summ. 1: 235 (1971) and 2: 866. 1971; Mold., Phytol. Mem. 2: 225 & 538. 1980.

This variety differs from the typical form of the species in being more or less strongly hairy throughout, the stems green, and the leaf-blades oblong.

The variety is based on *Braun* 5397 from Tabora, Tanganyika, collected on June 4, 1913, and deposited in the Berlin herbarium, now probably destroyed. Thomas (1936) cites also *Meyer* 1115 from Ussimbiro, Tanganyika, collected in 1911.

Citations: TANZANIA: Tanganyika: *Burt* 4889 (Ld--photo, N--fragment, N--photo, S).

CLERODENDRUM INAEQUIPETIOLATUM Good in Good & Exell, Journ. Bot.

Brit. 68: Suppl. 2: 141--142 [as "*Clerodendron*"]. 1930; B.

Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 75 & 94. 1936.

Synonymy: *Clerodendron inaequipetiolatum* Good in Good & Exell, Journ. Bot. Brit. 68: Suppl. 2: 141. 1930.

Bibliography: Good in Good & Exell, Journ. Bot. Brit. 68: Suppl.

2: 141--142. 1930; A. W. Hill. Ind. Kew. Suppl. 8: 54. 1933; B.

Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 42, 75, & 94. 1936;

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Known Geogr. Distrib. Verbenac., ed. 1, 47, 50, & 90 (1942) and ed.

2, 113, 118, & 181. 1949; Mold., Résumé 139, 146, & 450. 1959; H.

Huber in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 441 & 444. 1963;

Mold., Fifth Summ. 1: 223 & 242 (1971) and 2: 867. 1971; Mold., Phy-

tol. Mem. 2: 214, 132, & 538. 1980.

A yellowish- or yellowish-brown-hirsute scrambling shrub, about 3 m. tall; branches terete, densely hirsute especially on the nodes; leaves decussate-opposite; petioles to 5 cm. long, one of each pair longer than the other; leaf-blades obovate, to 18 cm. long and 12 cm. wide, one of each pair somewhat larger than the other, apically acute and mucronate, marginally sparsely subdentate, basally cordate, olivaceous and hispid above, the venation pubescent, paler beneath and the venation there also pubescent; secondaries about 7 pairs; tertiaries transverse; inflorescence corymbose, terminal, densely subcapitate; pedicels short, about 3 mm. long; bractlets filiform; calyx 5--6 mm. long, externally yellow-hirsute, the tube infundibular, 5-lobed, the lobes lanceolate-triangular, 2--3 mm. long, shorter than the tube, apically acute, ventrally glabrous; corolla white, the tube 8--9 mm. long, slightly longer than the calyx, glabrous on both surfaces, slightly constricted at the middle, the limb 5-lobed, the lobes ovate-suborbicular, spreading, 4--5 mm. long, about half as long as the tube, dorsally densely long-hirsute; stamens long-exserted; filaments filiform, about 0.8 mm. long, equaling the corolla-tube, glabrous; anthers oval, apically obtuse; style filiform, 10 mm. long, surpassing the corolla-tube, glabrous; ovary externally glabrous; fruit about the size and shape of a pea, glabrous.

This species is based on *Gossweiler* 7384 from the borders of woods near Fort Quisque, Cuanza District, Angola, collected in flower and immature fruit on January 13, 1918, and deposited in the herbarium of the British Museum (Natural History). Good (1930) comments: "Very nearly related to *C. Johnstonii* Oliv., but the flowers are smaller than in that species and this hirsute pubescence is quite distinct from its soft woolly tomentum". Huber (1963), however, says of *C. inaequipetiolatum*: "similar and closely akin to *C. sinuatum* [Hook.]"

Thomas (1936) cites the type collection and then notes that

"Diese Art ist mir nur aus der Beschreibung bekannt; danach müssten die beiden folgenden Nummern ihr zuzurechnen sein" -- *Gossweiler* 9487 from Angola and *Ledermann* 5438 from Cameroons. Huber (1963) cites *Savory* UCI.305 and *Ujer* FHI.30489 from the Cameroons. He distinguishes the present species from some of its small-flowered, mostly opposite-leaved relatives in western tropical Africa as follows (with his key somewhat modified by me):

1. Calyx 5 mm. long or longer; leaves glabrous.....*C. buchholzii*.
 - 1a. Calyx less than 5 mm. long, or, if longer, then the leaves markedly pilose.
 2. Calyx-lobes as broad as or broader than long, usually spreading; pedicels mostly more than 5 mm. long; leaves glabrous.
 3. Whole plant nigrescent when dry; petioles more than 3 cm. long.....*C. melanocrater*.
 - 3a. Plant not nigrescent; petioles only up to 2 cm. long.
 4. Branches puberulent; inflorescence elongate; rachis internodes usually 2 cm. or more long; corolla-tube 2 mm. or more wide, densely pilose.....*C. thyrsoideum*.
 - 4a. Branches glabrous; inflorescence short; rachis internodes less than 1 cm. long; corolla-tube less than 1 mm. wide, subglabrous.....*C. volubile*.
 - 2a. Calyx-lobes longer than broad, mostly erect; pedicels usually less than 5 mm. long; leaves usually pilose, especially on the venation beneath.
 5. Calyx pubescent, 5--7 mm. long; leaves always opposite, broadly ovate, pubescent on both surfaces.*C. inaequipetiolatum*
 - 5a. Calyx only minutely puberulent to subglabrous, 2--4 mm. long; leaves sometimes ternate, elliptic to ovate, glabrous above or slightly pubescent only on the midrib, pubescent only on the venation beneath.....*C. dusenii*.
 Citations: ANGOLA: Cuanza: *Gossweiler* 7384 [Mo. Bot. Gard. type photo A.88?] (Go--photo of type, Ld--photo of type, N--photo of type, W--photo of type). Loanda: *Gossweiler* 9487 (Ld, W--1550238).

CLERODENDRUM INCISUM Klotzsch in Peters, Reise Mossamb. Bot. 1: 257--258 [as "*Clerodendron*"]. 1861; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*]. 78. 1936.

Synonymy: *Clerodendron incisum* Klotzsch in Peters, Reise Mossamb. Bot. 1: 257. 1861. *Clerodendron lindemuthianum* Vatke, Linnaea 43: 537--538. 1882. *Clerodendron bernieri* Briq., Bull. Herb. Boiss. 4: 348--349. 1896. *Clerodendron incisum* var. *typica* Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 79. 1921. *Clerodendron incisum* var. *typica* Bakh. apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. *Clerod.*] 78 in syn. 1936. *Clerodendron incisum* Baker ex Mold., Résumé 272 in syn. 1959. *Clerodendron incisum* Vent. ex Mold., Résumé 272 in syn. 1959. *Clerodendron incisum* var. *typicum* Bakh. apud Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 799 in syn. 1962.

Bibliography: Klotzsch in Peters, Reise Mossamb. 6 [Bot. 1]: 257--258. 1861; Bocq., Adansonia, ser. 1, 2: 159. 1862; Vatke, Linnaea 43: 537--538. 1882; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; Gürke in Engl., Pflanzenw. Ost-Afr. C: 341. 1895;

Briq., Bull. Herb. Boiss. 4: 348--349. 1896; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 294 & 307--308. 1900; Koord. & Valet., Med.-ed. Lands Plant. Bat. 42 [Beijdr. Booms. Java]: 164. 1900; Backer, Tropische Natuur 5: 87. 1916; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 74, 79, 109, & ix. 1921; Beumee, Tropische Natuur 17: 176. 1928; Chiov., Fl. Somal. 2: 364, fig. 208. 1932; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1072. 1932; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 589. 1935; Patermann, Zytol. Untersuch. Verbenac. 36--38, [55], & [56], pl. 4, fig. 39, & pl. 5, fig. 1. 1935; Schimp. & Faber, Pflanzen-Geog., ed. 3, 1: 393. 1935; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 43, 78, & 94. 1936; Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Prelim. Alph. List Inv. Names 20 & 21. 1940; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 571. 1941; Worsdell, Ind. Lond. Suppl. 1: 238. 1941; Mold., Alph. List Inv. Names 18. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 46, 49, 51--53, 72, 84, & 90. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561. 1946; Mold., Alph. List Cit. 1: 4, 15, 17, 54, 67, 70, 72, 79, 198, 210, & 254. 1946; Glover, Prov. Check List Brit. Ital. Somal. 266. 1947; H. N. & A. L. Mold., Pl. Life 2: 50 & 69. 1948; Mold., Alph. List Cit. 2: 422, 578, & 607 (1948), 3: 705, 756, 770, 774, & 795 (1949), and 4: 986, 1018, 1047, 1049, & 1065. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 110, 116, 120, 123, 158, 181, 182, & 214. 1949; Mold., Biol. Abstr. 26: 185. 1952; Mold. in Humbert, Fl. Madag. 174: 148, 163--166, 266, & 267, fig. 35 (1 & 2). 1956; Synge in Chittenden, Roy. Hort. Soc. Dict. Gard., ed. 2, 1: 504 & 505. 1956; Mold., Résumé 135, 144, 146, 150, 155, 216, 260, 264, 266, 272, & 450. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561. 1960; Dale & Greenway, Kenya Trees Shrubs 582. 1961; Hansford, Ann. Myc., ser. 2, Beih. 2: 690. 1961; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 799. 1962; Mold., Résumé Suppl. 3: 28. 1962; H. Huber in Hutchins. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 440 & 442. 1963; Malaviya, Proc. Indian Acad. Sci. B. 58: 352, 357, & 358. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 359 & 362. 1963; Mold., Résumé Suppl. 11: 6. 1964; A. R. Rees, Journ. Ecol. 52: 9--17. 1964; Anon., Ind. Bibliogr. Bot. Trop. 2 (2): 23. 1965; Backer & Bakh., Fl. Java 2: 607. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 589. 1965; A. R. Rees, Hort. Abstr. 35: 161. 1965; Greensill, Trop. Gardening 105 & 123. 1966; Mold., Résumé Suppl. 13: 4 (1966) and 15: 7. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: 1348 & li. 1967; Corder & Watanabe, Illust. Guide Trop. Pl. 754. 1969; Mold., Résumé Suppl. 18: 9. 1969; Van der Pijl, Princip. Dispers. Higher Pl., ed. 1, 50. 1969; Gillett, Numb. Check-list Trees Kenya 46. 1970; Mold., Fifth Summ. 1: 221, 235, 240, 251, 259, 260, 358, 440, 447, & 462 (1971) and 2: 867. 1971; C. D. Adams, Flow. Pl. Jamaic. 636, 794, & 809. 1972; A. L. Mold., Phytologia 23: 319. 1972; Van der Pijl, Princip. Dispers. Higher Pl., ed. 2, 50 & 155. 1972; Mold., Phytologia 28: 445 & 448 (1974) and 34: 261. 1976; Isaacson, Flow. Pl. Ind. 1: 335. 1979; Mold., Phytol. Mem. 2: 204, 212, 225, 230, 240, 248, 249, 267, 306, 349, 386, 392, & 538. 1980; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 411 & 425--426. 1983; Mold., Phytologia 57: 34, 37, 337, & 339 (1985),

58: 185 & 197 (1985), 59: 260 & 486 (1986), and 60: 138. 1986.

Illustrations: Patermann, Beitr. Zytol. Verbenac. pl. 4, fig. 39, & pl. 5, fig. 1. 1935; Mold. in Humbert, Fl. Madag. 174: 165, fig. 35 (1). 1956; Greensill, Trop. Gardening 105. 1966.

An erect or spreading shrub or subshrub, 0.4--2 m. tall, or small tree to 3 m. tall, or often subherbaceous with a woody rhizome, much-branched; branches and branchlets rather slender, very obtusely tetragonal or subterete, grayish, lenticellate, scabrous, striate, glabrous or subglabrate; twigs slender, often brunnescent in drying, glabrate; nodes more or less annulate; principal internodes 1--9.5 cm. long or often even more abbreviated on short twigs; leaves decussate-opposite or ternate, abundant, short-petiolate; petioles very slender, 3--15 mm. long, glabrate, often obscure, mostly brunnescent or nigrescent in drying; leaf-blades membranous, dark-green above, fragile and mostly brunnescent or nigrescent above in drying, lighter beneath, broadly lanceolate, oblanceolate, or elliptic to obovate-elliptic or oblanceolate-oblong, 3--14 cm. long, 0.8--5 cm. wide, apically acuminate to long-acuminate, basally gradually attenuate, marginally coarsely serrate-dentate or incised-pinnatifid, varying to shallowly sinuate, from about the middle to the apex, sometimes entire, basally usually decurrent into the petiole, practically glabrous on both surfaces or rarely very obscurely pulverulent, sometimes finely pubescent when young, shiny on both surfaces, the venation simply pinnate, scarcely prominent and only sparingly reticulate; inflorescence mostly terminal, but some of the cymes also axillary in the uppermost leaf-axils, often sessile or subsessile and umbelliform to capitate, many-flowered, dense, usually 1--4.5 cm. long exclusive of the corollas, the individual cymes mostly 3-flowered and short-stipitate; peduncles obsolete or to about 1.5 cm. long, tetragonal, nigrescent, glabrous; foliaceous bracts often present, a single pair at the apex of the peduncle, oblong-lanceolate, resembling the leaves in all respects but only to 3 cm. long and 8 mm. wide, longer than the calyx; bractlets linear, 2--5 mm. long, nigrescent, glabrous; flowers fragrant, caducous; calyx campanulate-obconic or deltoid, mostly green, basally reddish, nigrescent in drying, mostly 2--5 mm. long, rarely to 7 mm. long, glabrous, the tube infundibular, the rim 5-dentate or -lobed, the teeth or lobes lanceolate or deltoid, unequal, mostly about 2 and 2.5 mm. long, apically attenuate-acuminate; corolla hypocrateriform, somewhat irregular, decidedly inrolled before maturity, white or rosy-white, its tube cylindric, slender, greatly elongate, 6--16 cm. long when fully developed, straight or curved "like a gooseneck (*fide* Goldsmith), 1--3 mm. wide, slightly contracted beneath the limb, externally very obscurely pilosulous or (usually) subglabrate to glabrous, the limb abruptly expanded, oblique, subbilabiate, 2--3 cm. wide, the lobes broadly elliptic, tinged or spotted with violet-purple, to 1.5 cm. long, the 2 upper ones narrower and shorter, not reaching to the base of the limb, glabrous on both surfaces; stamens long-exserted, involute in bud, surpassing the corolla-mouth by about 5 cm. at full anthesis; filaments red or violet-purple to wine-color (at least apically), often basally white, flattened, glabrous; anthers oblong or ovoid, about 2 mm. long, wine-color or purple, the connective

violet-purple; style long-exserted, apically purple or violet-purple, basally white, surpassing the stamens by 1--2.5 cm., glabrous; stigma bifid, the branches 2--3 mm. long; fruiting-calyx shallowly cupuliform, incrassate, to about 8 mm. wide, glabrous, brunnescenscent or nigrescent, the rim 5-lobed, the lobes lanceolate, 1--2 mm. long, apically acuminate; fruit drupaceous, very fleshy, globose, orange, about 1.5 cm. long and wide, the endocarp hard and bony.

Clerodendrum incisum, in its typical more glabrous form, occurs from Tanganyika to Mozambique and Madagascar, but varieties occur farther to the north and west. It has been cultivated, also, in Europe, Jamaica, Sri Lanka, and Madagascar. The typical form is based on a Peters collection from Boror, Mozambique.

Collectors have found *C. incisum* growing in sandy areas, on dunes and fertile hillsides, in primeval forests and the shrub layer of coastal forests, in shady places in deciduous forests, along roadsides, and among sandstone pebbles or crowded among limestone rocks, at 100--1000 m. altitude, in flower from November to February, as well as in June, August, and September, and in fruit in April. Goldsmith describes it as "a straggling shrub in well formed *Brachystegia spiciformis* woods", while Torre & Paiva encountered it in the shrubby *Baphia*- and *Bauhinia*-dominated stratum of *Brachystegia* forests in Mozambique. In Madagascar Humbert found it growing in the "rejets de souche dans la prairie periodiquement brulee".

The corollas are described as "white" by Baker (1900) and on *Decary* 1390, 1419, 1472, 1492, 1506, & 8012, *Drummond & Hemsley* 3786, *Goldsmith* 7/62, *Mendonca* 3784, *Peter* 21017, and *Torre & Paiva* 9408, as "milk-white" by Vatke (1882), as "rosy-white" on *Bernier* II.196, "white, but slightly rosy" on *Perrier* 832, as "white, the lobes spotted with red-purple" on *Humbert* 11600, and "blue" on *Peter* 24343.

The gynoeceum morphology is discussed and illustrated by Patermann (1935), while the method of seed dispersal is described by Van der Pijl (1969) as "a placental part of the pericarp adheres as an elaisome, usually serving for ornithochary".

Adams (1972) reports the species cultivated in Jamaica, where it is called "musical notes".

In regard to its periods of flowering, Rees (1964) found that although there appeared to be a close relationship between heavy rainfall and flowering in Southern Nigeria, it would seem most likely that it is not the rainfall itself, but the drop in temperature which is associated there with rainfall which initiates flowering.

Keys for helping to distinguish *C. incisum* from at least some of its relatives will be found under *C. baronianum* Oliv. (58: 184--190), *C. bethunianum* Low (58: 197--198), and *C. guerkei* J. G. Baker (60: 138) in the present series of notes.

The Madagascar population of *C. incisum* was named *C. lindemuthianum* by Vatke (1882) and his description contains a few terms that do not seem to apply to the continental populations, e.g., the leaf-blades "subcoriaceis....margine subrevolutis, cymis breviter pedipedicellatis laxiusculis in paniculas terminale dispositis..." It was based on *Hildebrandt* 3332 from Vavatóbé in northwestern Madagas-

car, collected in flower in February, 1880. He comments that "Ut e descriptione patet ad *Siphonanthi* sectionem, J. C. Schauer l.c. 670 pertinet. Exemplaria visa corollae limbum monstrose alte connatum ostendunt. Species dicata cl. Il. Lindemuth, prius in academia poppelsdorfensi horticulturne docenti, jam hortulano regio universitatis berolinensis."

Briquet (1896) named the Madagascar population *C. bernieri*, based on *Bernier* 11.196 from northern Madagascar, deposited in the Delesset herbarium at Geneva. His description differs somewhat in speaking of the "Folia....apice obtusa, mucronata, marginibus sat regulariter convexas". He comments that "Species insignis omnium *Verbenacearum* corollae tubo longissimo gaudet. Flores verisimillime inter mirabilissima omnium lepidopterophilorum praestant. Caeterum *C. Bernieri* affinis est *C. Siphonantho* R. Br., a quo praeter corollam, pulchre differt foliorum et calicis forma. Sola species est madagascariensis e sectione *Siphonantho*."

Bakhuizen (1921) also refers to the leaf-blades as "subcoriaceous above the middle, finally pubescent on both sides, especially on the nerves". It seems apparent that he is here referring not to the species proper, but to its var. *macrosiphon* (Hook. f.) J. G. Baker.

Cufodontis (1962) regards *C. macrosiphon* Hook. f. as a synonym not worthy of infraspecific designation, but Hooker's plant has pubescent branches, calyx, and corolla-tube, while typical *C. incisum* has these parts glabrous. He cites only the Peters type collection.

Thomas (1936) also places Hooker's binomial in synonymy. He cites the type and another Peters collection from Mozambique and *Holst* 453, *Schlieben* 5260, and *Stuhlmann* 6126 & 6639 from Tanganyika. I regard the Schlieben collection as representing var. *macrosiphon*. He comments that "Der Typus leg. Peters hat entgegen der Klotzsch'schen Priginalbeschreibung behaarten Kelch und auch vereinzelt behaarte Stengel. Infolgedessen fällt *C. macrosiphon*, der sich nur durch Behaarung von *C. incisum* abheben sollte, mit diesem zusammen; die Stärke der Behaarung ist selbst an einem Exemplar sehr wechselnd."

It should be noted, in passing, that Thomas (1936) mis-cites the original Klotzsch description as "1862", whereas it was actually published in 1861. It is also worth noting that the *Baron* 5460 specimen in the Kew herbarium is mounted on the same sheet as *Baron* 6889, but the latter represents *C. mirabile* J. G. Baker.

Baker (1900) cites only *Hildebrandt* s.n. from Kenya, *Holst* 2954 from Tanganyika [which I regard as var. *longipedunculatum* Thomas], and *Peters* s.n. from Mozambique and the Kerimba Islands. Huber (1964) cites *Kennedy* 1420 & 2640 from Southern Nigeria, commenting that the species is "Distributed from Somalia to Mozambique; probably only introduced in our area [west tropical Africa]".

Material of *C. incisum* has been misidentified as *C. glabratum* Gürke, *C. incisum* var. *macrosiphon* (Hook. f.) J. G. Baker, *Vernonia oxyphylla* DC., and *Rubiaceae*. On the other hand, the *Peter* 42178, distributed as *C. incisum*, seems to be *C. discolor* (Klotzsch) Vatke, *Holst* 2954 is *C. incisum* var. *longipedunculatum* Thomas and *Amaratunga* 344 & 1318, *Collector undetermined* s.n. [Roy. Bot. Garden-ia], *Moldenke*, *Moldenke*, & *Jayasuriya* 28156, and *Schlieben* 5260 are *C. incisum* var. *macrosiphon* (Hook. f.) J. G. Baker.

Citations: TANZANIA: Tanganyika: A. Peter 14883 [O.III.232] (B, B), 21008 [O.IV.198] (B, B), 21017 [O.IV.198] (B, B), 24036 [O.IV.317] (B), 24140 [O.IV.319] (B), 24343 [O.IV.327] (B), 51870 [Busse 1004] (B). KENYA: Drummond & Hemsley 3786 (B, S). MOZAMBIQUE: Manica e Sofala: Andrada 1011 (U1, U1); Garcia 218 (U1), 281 (U1); Goldsmith 7/62 (U1); F. A. Mendonca 3678 (U1), 3784 (Mu, U1); Salbany 105 (Ld, U1); Torre & Paiva 8408 (U1). Quelimane: Faulkner KEW.123 (Le, N, N, S). NOSY-BE ISLAND: Boivin s.n. [Fevr. 1851] (P). MADAGASCAR: Afzelius s.n. [14.5.1912] (N), s.n. [13.1.1913] (S); Baron 2787 (P), 5216 (P), 5460 (K, P), 6450 (P), 6647 (P); Bernier II.196 (E--photo, F--photo, Ld--photo, N--photo, P), II.329 (P); Boivin s.n. [1847-1852] (P); Brydolf s.n. [24/2/1967] (Gz); Decary 1390 (P), 1413 (P), 1419 (P), 1456 (N, P), 1472 (P), 1492 (P), 1506 (P), 8012 (P); Grandidier s.n. [Oct. 1869] (P); Hildebrandt 3332 (E--photo, F--photo, K, Ld--photo, N--photo, P); Humbert 11214 (P), 11600 (P); Kaudern s.n. [Majunga, V.1912] (S); Perrier 832 (P, P), 837bis (P), 10208 (P), 10286 (N, P); Petit II.20 (P); Poisson II.7l (P); Service Forestier 101 (P). CULTIVATED: Madagascar: Seyrig 36 (P).

CLERODENDRUM INCISUM var. *AFZELII* Mold., Amer. Journ. Bot. 38: 325. 1951.

Bibliography: Mold., Amer. Journ. Bot. 38: 325. 1951; Mold., Biol. Abstr. 26: 185. 1952; Mold. in Humbert, Fl. Madag. 174: 148, 166, & 267. 1956; Mold., Resume 155 & 450. 1959; Mold., Fifth Summ. 1: 260 (1971) and 2: 867. 1971; Mold., Phytol. Mem. 2: 249 & 538. 1980; Mold., Phytologia 58: 185. 1985.

This variety differs from the typical form of the species in having the calyx at time of anthesis about 10 mm. long.

The variety is based on an unnumbered Afzelius collection from Manasoa Tanosy, in the Province of Tuléar, Madagascar, collected on January 13, 1913, and deposited in the Kew herbarium. Thus far it is known to me only from the original collection.

Citations: MADAGASCAR: Afzelius s.n. [Manasoa Tanosy, 13.1. 1913] (E--photo of type, F--photo of type, K--type, Ld--photo of type, N--photo of type).

CLERODENDRUM INCISUM var. *LONGIPEDUNCULATUM* Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78. 1936.

Bibliography: B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 49 & 90 (1942) and ed. 2, 116 & 181. 1949; Mold., Résumé 144 & 450. 1959; Mold., Fifth Summ. 1: 235 (1971) and 2: 867. 1971; Mold., Phytol. Mem. 2: 225 & 538. 1980.

This variety differs from the typical form of the species in having the peduncles 2--3 cm. long. The cymes are axillary and the calyx is split almost halfway down, with wide lobes that are glabrous or only sparingly villose.

The variety is based on Hildebrandt 1911 from the coast of Zanzibar, collected in December 1875 and deposited in the Berlin herbarium, now doubtless destroyed. Thomas (1936) cites also Holst

2954 AND *Stuhlmann* 7005 FROM Tanganyika.

Citations: TANZANIA: Tanganyika: *Holst* 2954 (Mu--1745).

CLERODENDRUM INCISUM var. *MACROSIPHON* (Hook. f.) J. G. Baker ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 80 [as "*Clerodendron*"]. 1921; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78 in syn. 1936; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 72 & 90. 1942.

Synonymy: *Clerodendron macrosiphon* Hook. f., Curtis Bot. Mag. 109 [ser. 3, 39]: pl. 6695. 1883. [not *C. macrosiphon* (Baker) Pieper, 1928]. *Clerodendron macrosiphon* Hook. ex Gürke in Engl., Pflanzenw. Ost-Afr. C: 340. 1895. *Cyclonema macrosiphon* Wigman, Teysmannia 23: 286 in syn. 1912. *Clerodendrum macrosiphon* Hook. apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78 in syn. 1936. *Clerodendrum incisum* var. *macrosiphon* Baker apud B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78 in syn. 1936.

Bibliography: Hook. f., Curtis Bot. Mag. 109 [ser. 3, 39]: pl. 6695. 1883; "W. W.", Garden 42: 563. 1892; Bois, Dict. Hort. 1: 334. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893; Gürke in Engl., Pflanzenw. Ost-Afr. C: 340. 1895; J. G. Baker in Thiseit.-Dyer, Fl. Trop. Afr. 5: 308. 1900; Koord. & Valet., Meded. Lands Plant. Bat. 42 [Beijdr. Booms. Java 7]: 164. 1900; Woodrow, Gard. Trop., ed. 1 [Gard. India, ed. 6, imp. 8], 438. 1910; Wehmer, Pflanzenst. 1: 648. 1911; Wigman, Teysmannia 23: 284/285 & 286, fig. 5. 1912; Backer, Tropische Natuur 5: 87. 1916; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 80. 1921; Beumee, Tropische Natuur 17: 176. 1928; Wehmer, Pflanzenst. 2: 1024. 1931; Grey & Hubbard, List Pl. Atkins Inst. 59. 1933; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 589. 1935; H. F. MacMill., Trop. Plant. Gard., ed. 4, 104. 1935; Schimp. & Faber, Pflanzen-Geogr., ed. 3, 1: 393. 1935; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78 & 94. 1936; Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Lilloa 4: 331. 1939; Mold., Prelim. Alph. List Inv. Names 21. 1940; Worsdell, Ind. Lond. Suppl. 1: 238. 1941; Mold., Alph. List Inv. Names 18. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 72 & 90. 1942; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 1, 104 (1943) and ed. 5, imp. 2, 104. 1946; Mold., Alph. List Cit. 1: 15, 17, 54, 67, 70, 72, 79, 198, 210, & 254. 1946; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 3, 104. 1948; Mold., Alph. List Cit. 2: 422 & 607 (1948), 3: 705, 756, 770, 774, & 795 (1949), and 4: 986, 1018, 1037, 1049, & 1065. 1949; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 4, 104. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 158 & 182. 1949; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 5, 104 (1952), ed. 5, imp. 6, 104 (1954), and ed. 5, imp. 7, 104. 1956; Syngé in Chittenden, Roy. Hort. Soc. Dict. Gard., m ed. 2, 1: 505. 1956; Mold., Résumé 216, 266, & 450. 1959; Hansford, Sydowia Ann. Myc., ser. 2, Beih. 2: 690--691. 1961; Hundley & Ko in Lace, Trees Shrubs Burma, ed. 3, 203. 1961; Willam. & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 236. 1961; Cuf., Bull. Jard. Bot. Brux. 32: Suppl. 799. 1962; Harler, Gard. Plains, ed. 4, 159. 1962; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 8, 104. 1962; Mold., Résumé Suppl. 3: 28.

1962; Malaviya, Proc. Indian Acad. Sci. B.58: 352, 357, & 358. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 359, 360, 362, 374, 379, & 381, pl. 9, fig. 6. 1963; R. Good, Geogr. Flow. Pl. 202. 1964; Mold., Résumé Suppl. 11: 6. 1964; Backer & Bakh., Fl. Java 2: 607. 1965; Burkill, Dict. Econ. Prod. Malay Penins. 1: 589. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 40. 1965; Hore & Bose, Bull. Bot. Surv. India 10: 165 & 167--170. 1968; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 715. 1969; Corner & Watanabe, Illust. Guide Trop. Pl. 754. 1969; Roy & Bose, Hortic. Sci. 1 (2): 39--44. 1969; Anon., Biol. Abstr. 52: 11335 (1971) and 52 (20): B.A. S.I.C. S.51. 1971; Mold., Fifth Summ. 1: 358 & 450 (1971) and 2: 867. 1971; A. L. Mold., Phytologia 23: 319. 1972; Mold., Phytologia 23: 430. 1972; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 715. 1974; Maiti, Pl. Sci. Lucknow 6: 104--105. 1974; Mold., Phytologia 28: 448 (1974) and 34: 261. 1976; "B.J.G.", Biol. Abstr. 65: 3289. 1977; Mold., Phytol. Mem. 2: 306, 349, 392, & 538. 1980; H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 411 & 425--426. 1983; Mold., Phytologia 57: 37 & 337. 1985. Illustrations: Hook. f., Curtis Bot. Mag. 109 [ser. 3, 39]: pl. 6695 (in color). 1883; Wigman, Teysmannia 23: 284/285, fog. 5. 1912; Schimp. & Faber, Pflanzen-Geogr., ed. 3, 1: 393. 1935; Sharma & Mukhopadhyay, Journ. Genet. 58: pl. 9, fig. 6. 1963; Corner & Watanabe, Illust. Guide Trop. Pl. 754. 1969.

This variety differs from the typical form of the species in having the branchlets, calyx, and exterior of the corolla-tube somewhat pilose- (sometimes glandulose-) pubescent.

Collectors and authors describe this plant as an erect bush, undershrub, or slender shrub, 1--2 m. tall, strongly branched, profusely flowering; branchlets slender, gray, subtetragonal, very densely short-pubescent or spreading-puberulent; nodes not annulate; principal internodes 1.5--5 cm. long; leaves decussate-opposite or ternate, usually with small ones in their axils; petioles very slender, 2--15 mm. long or sometimes obsolete, densely short-pubescent; leaf-blades chartaceous, uniformly dark-green on both surfaces, brunnescient or nigrescent in drying, narrowly elliptic or oblanceolate to oblong-lanceolate or oblong-obovate, 3--12.5 cm. long, 1--5 cm. wide, apically acute to long-acuminate, marginally entire (on small leaves) or with 1--4 coarse, widely divergent, and apically acute teeth on each margin near the middle (on larger leaves), the number often not the same on either side, basally attenuate or long-acuminate, very minutely strigillose-puberulent above, more densely puberulent (especially on the larger venation) beneath; Midrib slender, flat above, prominulent and densely puberulent beneath; secondaries very slender, 5--8 per side, arcuate-ascending, usually not extending directly into the marginal teeth, plainly visible above, slightly prominulent beneath; vein and veinlet reticulation very slender, obscure above, the larger parts very slightly prominulent beneath or obscure; inflorescence axillary and terminal; cymes small, few- to many-flowered, dense, subcapitately corymbose, very short-pedunculate, the flowers extremely large and showy, subsessile, expanding in the evening, falling off the next morning, the cymes after the corollas have fallen off only about 1 cm. long and wide; flower-buds

"with a deflexed apex, comma-shaped" (fide Backer & Bakh.); peduncles very short and sparsely soft-pubescent or obsolete; pedicels rather stoutish, 3--5 mm. long, puberulent; bractlets and prophylla small, linear-setaceous, sparsely short-pubescent or puberulent; calyx 5--6 mm. long, divided to over 1/3 its length; corolla hypocrateriform, white or yellowish-white to greenish-white, the tube 7--13 cm. long, externally thinly pilose or glandular-pubescent, circinnate in bud, later unrolling and elongating rapidly during anthesis, soon deciduous, the limb rather flat, about 3 cm. wide, shallowly 5-lobed, all the lobes directed forward, the median one longest; stamens exserted, pink to red or purple; filaments 5 cm. long; fruiting-calyx coriaceous, campanulate, about 5 mm. long and wide, shiny, prominently venose, the rim sharply 5-lobed with narrow-triangular spreading lobes; fruit drupaceous, at first green, dark-purple when ripe, obovate, about 7 mm. long and 9 mm. wide, conspicuously 4-lobed but usually only 2-seeded, nigrescent in drying, externally glabrate; chromosome number: $2n = 30$.

This taxon is based on a specimen cultivated in the Royal Botanic Gardens, Kew, and deposited in that herbarium, from seed originally collected by Sir John Kirk at Usaramo, Tanganyika (Tanzania) in 1881 -- not in "Zanzibar" as claimed by MacMillan (1943).

This plant is widely cultivated for ornament outdoors in tropical Asia and America and in greenhouses in Europe and the United States. It is easily propagated by cuttings. Dwarfing may be induced with an appreciable reduction in shoot length and the production of 100% more flowers by application of Cycocel dust or foliar spray. Roy & Bose (1969) were able to initiate flowering only under longdaylight conditions. It is sometimes attacked by the fungus, *Meliola cookeana* var. *viticis* Hansf. as recorded by Hansford (1961) from Java (based on *BO.11728*) and Malaya (based on *Johnston 1631*).

The absence of stone-cells in this plant was verified by Malaviya (1963). Vernacular names listed for it are "glorybower" and "ngayanpadu".

Collectors have encountered the plant in rocky terrain, at 16--310 m. altitude, in flower in January, March, April, June, and August to October, and in fruit in March. Backer & Bakhuizen (1965) assert that in Java it blossoms intermittently throughout the year. Amaratunga found it growing, apparently wild (escaped), along roadsides in Sri Lanka. Schlieben refers to it as an "abundant herb, 20--60 cm. tall" in Tanzania. Sen & Neskar (1965) record it as cultivated in India; Backer & Bakhuizen (1965) list it from Java gardens; Burkill (1966) found it in cultivation in Malaya. Hundley & Ko (1961) report it as native to Zanzibar and cultivated in Burma; Corner & Watanabe (1969) include it among plants in common cultivation in tropical gardens; Grey & Hubbard (1933) list it as cultivated in Cuba from seed collected by E. F. Atkins in Florida in March 1917, while the unnumbered Fennell collection (cited below) was taken from plants grown in Florida from cuttings made by Walsingham in Cuba. Rimaldo & Pancho assert that the plant is "rare in the Philippines, recently introduced".

The corollas are described as "white" by Woodrow (1910) and by

Corner & Watanabe (1969) and on *Amaratunga* 344, *Jiménez* 4603, *Nur* s.n., *Pancho* 1063, *Rinaldo* & *Pancho* 76, and *Schlieben* 5260, "pure-white" on *Fennell* s.n. and *Hort. Kew. s.n.*, "creamy-white" on *Moldenke*, *Moldenke*, & *Jayasuriya* 28156, "white or yellowish-white" on *Pancho* 2069, and "greenish-white" on *Mejía* & *Zanoni* 6743.

Pancho describes the inflorescences as "many-flowered, crowded, lateral umbels". Fennell refers to the leaf-blades as "notched or pinnatifid" and the cymes terminal.

The chromosome number is reported by Sharma & Mukhopadhyay (1963) as $2n = 30$. Maiti (1974) discusses the technique of regeneration of terminal greenwood cuttings with the use of Seradix B₁ in auto-humid chambers. Wehmer (1911) asserts that there are some alkaloids present in the leaves.

It should be noted, in passing, that the *Clerodendron macrosiphon* (Baker) Pieper, referred to in the synonymy (above) is a synonym of *Clerodendrum thomasi* Mold., which see. It may also be mentioned that Thomas (1936) mis-cites the Bakhuizen (1921) reference to *C. incisum* var. *macrosiphon* as page "79" instead of page 80.

This variety is regarded as synonymous with typical *C. incisum* Klotzsch by Cufodontis (1962) and by Thomas (1936) -- the latter author asserts that glabrous and pubescent material can be found on the same plant. Yet, after examination of a large series of specimens, I must report that the extremes are certainly quite noticeably different. Perhaps, in view of Thomas' statement, the pubescent form (*macrosiphon*) should be demoted to form, rather than varietal rank.

Material of *C. incisum* var. *macrosiphon* has been distributed widely in herbaria as typical *C. incisum* Klotzsch, as well as *C. indicum* (L.) Kuntze. On the other hand, it seems that *Peter* 14883, 21008, 21017, 24036, 24140, & 24343, distributed as var. *macrosiphon*, are better regarded as typical *C. incisum* Klotzsch.

Citations: TANZANIA: Tanganyika: *Schlieben* 5260 (B, Br, Mu, N, S), 5260a (B). SRI LANKA: *Amaratunga* 344 (Pd), 1318 (Pd). PHILIPPINE ISLANDS: Luzon: *Rinaldo* & *Pancho* 76 (Ba). CULTIVATED: Burma: C. E. Parkinson 14460 (K). Cuba: J. G. Jack 5326 (A, B, N, P, W--1476478). Dominican Republic: J. J. Jiménez 4603 (W--2519407); *Mejía* & *Zanoni* 6743 (N). England: *Herb. Kew. s.n.* [May 19, 1882] (K--type). Florida: *Atkins* s.n. [March 1917] (N); *Fennell* s.n. [Pl. Introd. 90871; PQCA.013073] (Ar--17073, Ba). Federated Malay States: *Foxworthy* 4905 (K). India: *Bourne* s.n. [Madras, 14 Nov. 1900] (K). Jamaica: L. H. Bailey 737 (Ba, Ba, Ld--photo, N--photo); P. Browne s.n. (Ld--photo, N--photo); *Mandeville* 206 (Ba). Java: *Bakhuizen* 2274 (Ut--24897A); H. Hallier C.33 (Le); *Herb. Hort. Bot. Bogor. XI.G.6a* (Bz--19379, Bz--19380), XV.K.A.XLVI.20 (Bz--26471, Bz--26472, N). Netherlands: *Herb. Mus. Bot. Haun. P.1912/352* (Cp). New York: N. Taylor s.n. [N. Y. BOT. GARD. Cult. Pl. 3291] (N, N). Philippine Islands: *Pancho* 1063 (Ba). Singapore: *Nur* s.n. [10 March 1925] (Ba). Sri Lanka: *Collector undetermined* s.n. [Roy. Bot. Gard. Perad., July 1889] (Pd); *Moldenke, Moldenke, & Jayasuriya* 28156 (Ld, Pd, W--2764420). Tobago: W. E. Broadway 2444 (Ed, K), s.n. [Oct. 10, 1912] (Cb, Cb, E--703077, G, G, Le, N, P, P, S, W--759443, W--1177971).

MOUNTED ILLUSTRATIONS: Corner & Watanabe, *Illust. Guide Trop. Pl.*

754. 1969 (Ld); H. N. Moldenke color slides 476 (Ld).

CLERODENDRUM INCISUM var. *PARVIFOLIUM* Mold., Phytologia 3: 407. 1951.

Bibliography: Mold., Phytologia 3: 407. 1951; Mold. in Humbert, Fl. Madag. 174: 148, 165, 166, & 267, fig. 35 (2). 1956; Mold., Résumé 155 & 450. 1959; Mold., Fifth Summ. 1: 260 (1971) and 2: 867. 1971; Mold., Phytol. Mem. 2: 249 & 538. 1980; Mold., Phytologia 58: 185. 1985.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 165, fig. 35 (2). 1956.

This variety differs from the typical form of the species in having its leaf-blades only 1--3 cm. long and 4--10 mm. wide during full anthesis.

The variety is based on *Humbert 12741* from Mount Vohitrosy in the lower valley of the Mandrare near Anadabolava, Madagascar, at 800--850 m. altitude, collected in December of 1933 and deposited in the Paris herbarium. Thus far it is known to me only from the original collection.

Citations: MADAGASCAR: *Humbert 12471* (Ld--photo, N--fragment of type, N--photo of type, P--type, P--isotype).

CLERODENDRUM INCISUM var. *VINOSUM* Chiov., Fl. Somalia 2: 364, fig.

208 [as "*Clerodendron*"]. 1932; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78. 1936.

Synonymy: *Clerodendron incisum* var. *vinosum* Chiov., Fl. Somalia 2: 364, fig. 208. 1932.

Bibliography: Chiov., Fl. Somalia 2: 364, fig. 208. 1932; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 78. 1936; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 571. 1941; Worsdell, Ind. Lond. Suppl. 1: 238. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 46, 49, 51, & 90. 1942; Glover, Prov. Check List Brit. Ital. Somal. 266. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 110, 116, 120, & 182. 1949; Mold., Résumé 135, 144, 150, & 450. 1959; Cut., Bull. Jard. Bot. Brux. 32: Suppl. 799. 1962; Mold., Fifth Summ. 1: 213, 235, & 251 (1971) and 2: 867. 1971; Mold., Phytol. Mem. 2: 204, 225, 240, 386, & 533. 1980; Mold., Phytologia 57: 34. 1985.

Illustrations: Chiov., Fl. Somalia 2: 364, fig. 208. 1932.

This variety differs from the typical form of the species in having its leaf-blades regularly suffused with red.

It is based on *Senni 541* from Licchitore in Transjuba (Oltregiuba), Somalia, collected on July 22, 1929, and deposited in the Florence herbarium.

Thomas (1936) cites, in addition to the type collection, *Busse 1004* and *Engler s.n.* from Tanganyika and *Schlechter 12078* from Mozambique. Cufodontis (1962) lists the variety from southeastern Ethiopia.

Nothing further is known to me of this plant.

CLERODENDRUM INDICUM (L.) Kuntze, Rev. Gen. Pl. 2: 508 [as "*Clerodendron*"]. 1891; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 4 & 90. 1942.

Synonymy: *Lysimachia indica* Bondt, Hist. Nat. Med. Ind. Orient. 159--160 [as "*Lysimachio indico*"]. 1658. *Siphonanthemum* Amman, Comment. Acad. Sci. Imp. Petrop. 8: [Quinq. Nov. Pl. Gen.] 213--215, pl. 15. 1736. *Siphonanthus indica* L., Sp. Pl., ed. 1, imp. 1, 1: 109. 1753. *Oviada mitis* L., Sp. Pl., ed. 2, 2: 889. 1763. *Siphonant. indica* Amm. ex L., Mant. Pl. 331. 1767. *Oviada mitis* Burm. ex Scop., Introd. Hist. Nat., 171. 1777. *Oviada foliis lanceolatis subrepandis* Burm. ex Gaertn., Fruct. Sem. Pl. 1: 272 in syn. 1788. *Montalbania* Neck., Elem. 1: 271. 1790. *Lysimachii species* Pison. ex Lam., Encycl. Méth. Bot. 1: 318 in syn. 1791. *Siphonanthus indica* Rausch., Nom. Bot., ed. 3, 36. 1797. *Siphonanthus angustifolia* Willd. in L., Sp. Pl., ed. 4, 1 (2): 606. 1798. *Clerodendron siphonanthus* R. Br. in Ait., Hort. Kew., ed. 2, 4: 65. 1812. *Clerodendrum siphonanthus* H. K. ex Desf., Tabl. Ecol. Bot., ed. 2, 64, 1815. *Clerodendron longicolle* G. F. W. Mey., Prim. Fl. Esseq. 217. 1818 [not *C. longicollis* Borgeas & Paulsen, 1959]. *Siphonanthus indicus* L. apud Steud., Nom. Bot. Phan., ed. 1, 578 in syn. 1821. *Clerodendrum siphonanthus* Ait. ex Steud., Nom. Bot. Phan., ed. 1, 782 in syn. 1821. *Siphonanthus indica* var. *angustifolia* Poir. ex Steud., Nom. Bot. Phan., ed. 1, 782 in syn. 1821. *Clerodendrum longicolle* Meyer apud Steud., Nom. Bot. Phan., ed. 1, 207. 1821. *Oviada verticillata* Roxb. ex D. Don, Prodr. Fl. Nepal. 102 in syn. 1825. *Clerodendrum verticillatum* (Roxb.) D. Don, Prodr. Fl. Nepal. 102. 1825. *Clerodendron longicolla* Mey. apud Spreng. in L., Syst. Veg., ed. 16, 2: 758. 1825. *Clerodendrum verticillatus* D. P. ex Sweet, Hort. Brit., ed. 1, 1: 322. 1826. *Clerodendrum verticillatum* D. Don apud Loud., Hort. Brit., ed. 1, 247. 1830. *Oviada siphonanthus* Roxb. ex Wall., Numer. List 86, no. 1784F. 1831. *Clerodendrum siphonanthus* R. Br. apud Bojer, Hort. Maurit. 255. 1837. *Clerodendron siphonanthus* Spreng. ex J. Grah., Cat. Pl. Bomb. 157. 1839. *Oviada inermis* Burm. ex Steud., Nom. Bot. Phan., ed. 2, 383 in syn. 1840 [not *O. inermis* (L. f.) Baill., 1891, nor Retz., 1772]. *Clerodendron siphonanthus* p. *angustifolium* Hassk., Flora 25: Beibl. 27. 1842. *Clerodendron fortunatum* Blume ex Hassk., Flora 25: Beibl. 27 in syn. 1842 [not *C. fortunatum* Blanco, 1837, nor Buch.-Ham., 1831, nor Burm., 1962, nor L., 1756, nor Sesse & Moc., 1894, nor Wall., 1885]. *Clerodendron angustifolium* (Willd.) Hassk., Cat. Pl. Hort. Bogor. Cult. 136. 1844. *Siphonanthus indica* Willd. ex Schau. in A. DC., Prodr. 11: 670 in syn. 1847. *Siphonanthus indica* Lam. ex Roxb., Fl. Indica, ed. 2, imp. 2, 481. 1874. *Clerodendron mite* (Burm.) Vatke, Linnaea 43: 537. 1882 [not *C. mite* Vahl, 1931]. *Clerodendron verticillatum* Don ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 595 in syn. 1885. *Clerodendron indicum* (L.) Kuntze, Rev. Gen. Pl. 2: 506. 1891. *Clerodendron mite* Vatke apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561. 1893. *Oviada inermis* Burm. f. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 386 in syn. 1894 [not *O. inermis* (L. f.) Baill., 1891, nor Retz., 1772]. *Oviada verticillatum* Roxb. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 386 in syn. 1894. *Clerodendron indicum* Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 101 in syn. 1901. *Clerodendron siphonanthus* Ait. apud Wigman, Teysmannia 23: 279. 1912. *Clerodendron siphonanthus* (R. Br.) Ait. ex Wigman, Teysmannia 23: 288. 1912. *Clerodendron*

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BOOK REVIEWS

Alma L. Moldenke

"DEVELOPMENTAL BIOLOGY OF HIGHER FUNGI" edited by D. Moore, L. A. Casselton, D. A. Wood & J. C. Frankland, xii & 615 pp., 141 b/w multi-fig. incl. 184 photo. & 75 tab. Cambridge University Press, Cambridge & London, U.K. & New York, N. Y. 10022. 1985. \$99.50.

These 27 well composed papers are from an important symposium of the British Mycological Society at the University of Manchester in 1984. The preface orients readers to consider developmental biology to include "not only structural form -- both vegetative and reproductive -- but also how that form relates to an organism's ecological niche.....Many of the most obvious, and most intellectually challenging, morphogenic features are a direct contribution to ecological performance." Some of the topics presented are: mycorrhizal dynamics during forest tree development, dikaryon formation, developmental characteristics of agarics, biochemistry of *Agaricus* fructification, strategies for mushroom breeding, and biological and technical aspects of commercial mushroom breeding. This book is needed in college and university libraries and fungal breeding and biochemical laboratories.

"EMBRYOGENESIS IN ANGIOSPERMS. A Developmental and Experimental Study" by V. Raghavan, xiii & 303 pp., 33 b/w multi-fig. incl. 75 photo. & 4 tab. Cambridge University Press, Cambridge & London, U.K. and New York, N. Y. 10022. 1986. \$39.50.

Herein the author has brought together in synoptic form "the most recent knowledge on the theoretical, developmental and experimental facets of embryogenesis in angiosperms.....using a systems approach based on data from morphology, anatomy, genetics and biochemistry". There are chapters on developmental embryogenesis, its cellular, biochemical, pollen, somatic, experimental and applied aspects and their significances toward some important applications in our agriculture. This study is needed in agricultural, college and university libraries.

"THEORETICAL STUDIES ON SEX RATIO EVOLUTION" by Samuel Karlin & Sabir Lessard, xv & 314 pp., 11 b/w fig. & 11 tab. Princeton University Press, Princeton, New Jersey 08540. 1986. \$47.50.

This book is the 22nd of the excellent monographs in Population Biology edited by Robert M. May. It is especially important for those who can follow intelligently all of the many carefully devel-

oped mathematical explanations on sex ratio theory. More than 60% of this material embodies new research. There are several models developed for concepts and parametrization for the 2-3-loci multi-allele sex-determining systems and some for incompatibility and haplodiploid mixed parthenogenesis, etc. Gregor Mendel has been identified as "a young mathematician whose statistical interests extended to the physical and biological sciences, who modeled his laws of inheritance to be consistent with his experimental results." This study should be of very real interest to reproductive biologists, ecologists and graduate students. University libraries should surely have this book available.

"THE COMPLETE HANDBOOK OF GARDEN PLANTS" by Michael Wright, 544 pp., 260 multicolor pl., 1 b/w map & 2 tab. Facts on File Publications, Inc., New York, N. Y. 10016. 1984. \$18.95.

This book "bespeaks" its text as originally oriented for British gardens (despite its hardiness zone map for the U.S.A), but because of the longtime and widespread horticultural trade, this book should be helpful and delightful to English-reading gardeners the world over and to travelers on now popular horticultural, estate and gardening tours. In this compact size book over 9000 species and varieties are described and over 2500 are illustrated on the lovely 260 color plates. The plants are grouped practically as: evergreen and leafy trees and shrubs, perennial climbers, border and bedding perennials, bulbs, corms, tubers, rock plants, annuals and biennials and water plants. Growing limitations and suggestions are given in the text. Even though the first column of the S's in the index is "irregular", this book is highly recommended especially for accomplishing so much in so small a space.

"SCIENCE AND CIVILIZATION IN CHINA" by Joseph Needham with the collaboration of Lu Gwei-Djen and a special contribution by Huang Hsing-Tsung, Volume 6 Biology and Biological Technology, Part I Botany, xxii & 718 pp., 89 b/w fig. & 22 tab. Cambridge University Press, Cambridge & London, U.K. & New York, N. Y. 10022 1986. \$95.00.

And probably the title information would have been even more elongated with articles by Georges Metailie if he had submitted on time his articles on Chinese knowledge of plant processes, horticultural techniques, gardening and the influence of Chinese flora and botany on modern plant sciences. This wonderful historical survey starts with China's plant geography, common and learned names in botanical linguistics from the earliest records forwards, continues with wild food plants, explorations of the borderlands, development of ornamental and pharmaceutical plants, information on crop improvement and natural pest control. Expectedly the three bibliographies are widely collected: (1) Chinese and Japanese books before

1800, (2) those since 1800 and (3) books and journals in Western languages. The general index gives a table of Chinese dynasties and a romanization conversion table. Surely this book -- this series -- belongs in college and university libraries around the world.

"ATLAS OF MARITIME HISTORY" by Richard Natkiel & Anthony Preston, 256 pp., 205 b/w photo., 15 fig. & 356 color-routed maps. Facts on File Publications, Inc., New York, N. Y. 10016. 1986. \$29.95.

Why this book was sent to this botanical journal, I cannot guess, but with its many clear line-routed maps, its historically important figures, fine photographs and succinctly written and clearly legible text, it is indeed pleasurable and worthwhile to peruse. The introductory chapters on the ancient and the medieval worlds and the age of exploration give botanists opportunities to recall the actual paths of introduction for exotic food, spice, fiber, timber, horticultural and other plants. The other six chapters are war infested up to this present age, but they are also very effectively presented.

"SEVEN CLUES TO THE ORIGIN OF LIFE -- A Scientific Detective Story" by A. G. Cairns-Smith, xii & 131 pp. Cambridge University Press, Cambridge & London, U.K. and New York, N. Y. 10022. 1985. \$17.95.

Using the ingenious cover of a Sherlock Holmes-Dr. Watson drawn out question-answer conversation about the origin of life, the author develops seven clues very logically in reasonably clear and simple molecular and chemical terms for the inquiring intelligent layman, discards false leads with typical Holmesian logic and ends up with a clay-making machine whose molecular variations could have produced a naked gene, "a hypothetical minimal primary organism that has no separate phenotype.....Life would have been a later gradual emergence (spontaneous generation) of secondary organisms "through a gradual replacement of a genetic takeover." This carefully worked out theory just seems to go back earlier in the life-out-of-slimy-ooze concept. Very interesting.

"THE ENCYCLOPEDIA OF REPTILES AND AMPHIBIANS" edited by Dr. Tim R. Halliday & Dr. Kraig Adler, iii & 143 & viii--xvi pp., 131 color photo., 1 b/w photo., 16 color fig., 13 b/w fig., 77 color geog. distrib. maps, 10 tab. & 9 comparative size b/w fig., Facts on File Publications, Inc., New York, N. Y. 10016. 1986. \$24.95.

A true encyclopedia this is not, but an excellent, really interesting, attractive and beautifully illustrated survey of the world's

major reptiles and amphibians it most surely is with its contributions from 19 experts on all the families of these animals. For amphibians their geological history is surveyed, also their living adaptations for both water and land habitats, and their courtships, leaping and chorusing. For reptiles true dinosaurs are distinguished from archosaurs, temperature regulation is explained by exposure to sun and shade, and the gavial (U.S. dictionaries and genus *Gavialis*) or gharial (Oxford dictionary and Hindi) is shown (photo) in protective padding for transportation for safe release into the wild. This book is emphatically recommended for all public, school, college, and personal libraries of enthusiasts about these creatures.

"THE ENCYCLOPEDIA OF INSECTS" edited by Christopher O'Toole, v & 143 & x--xvi pp., 160 color photo., 3 b/w photo, 1 color map, 78 chart outlines, 14 color draw. & 96 b/w draw. Facts on File Publications, Inc., New York, N. Y. 10016. 1986. \$24.95.

Like "The Encyclopedia of Reptiles and Amphibians", this treatise is also not a real encyclopedia, but it is likewise an excellent survey of the world of insects and the insects of the world, as well as a similarly developed section on arachnids and a briefer one on myriapods. This editor and the 21 sectional expert contributors use the phylum name *Uniramia*: they are all functioning experts in their fields who know how to write interestingly and effectively. Beetles get their due as "the most successful group of animals on Earth, forming almost one-third of all described animal species and about two-fifths of all insects". The very excellent color photographs catch dynamic, dramatic poses instead of limp-looking dead things with pins or pin-holes in them. The use of boxed or chart forms for certain information is an effective device against any tedium in reading all the substantive material in the text. This book also belongs in school, public, college and university libraries as an excellently presented source of information. It should be a stimulating gift for any young person interested in insect life.

"ESCRITOS ETHNOBOTANICOS: Dictamo Afrodisíacos, Plantas Irritantes o Alérgicas, Asma, Mapurite o Anamú, Diabetes" by Santiago López-Palacios, 323 pp. & 24 b/w & 1 color pl. Dep. Botánica y Farmacognosia, Mérida C.P.5101, Venezuela. 1985. Paperbound.

The author, our friend of long standing, has presented a valuable study on a worldwide scale over a long span of time from the literature and especially from South American plant sources. Such information is now of increasingly appreciated importance for furthering pharmaceutical and medical research for more and better disease control. He also stresses that some native medical recommendations are only based on hearsay, that dependence on just the common plant names may not be reliable. A printed slip of corrections of printing errors is included; it caught some but not all of the misspellings. The fullpage plant plate drawings are well done and are particularly

attractive printed in green -- which is so natural for most observable parts of plants.

"SPIDERS OF THE WORLD" by Rod & Ken Preston-Mafham, 191 pp., 66 color pl., 38 b/w pl. & 35 b/w multi-fig. draw. Facts on File Publications, Inc., New York, N. Y. 10016. 1984. \$17.95.

This is a very effectively developed and very attractively illustrated survey of both the spiders of the world and the world of spiders. The chapters describe their classification (using the name *Arthropoda* as the phylum designation), courtship and mating (recording some as parthenogenetic), their life histories (with the marvels of web-making and use), prey capturing, defense mechanisms, and their relations with man. The introduction states that "Little Miss Muffet was probably a daughter of a Thomas Muffet, a keen spider enthusiast". The final chapter closes with "spiders and their insect prey are far better equipped for survival in the long term than man himself...., it is certain that spiders will still be laying traps for flies long after man has finally disappeared from the earth".

"THE QUANTUM WORLD" by J. C. Polkinghorne, xi & 100 pp. & 9 b/w fig. Princeton University Press, Princeton, N. J. 08540; (1984 Longman Group Ltd., hardcover) Princeton University Press, 1984. \$6.95 paperbound.

The author was a former professor in the department of Applied Mathematics and Theoretical Physics in the University of Cambridge and is now an Anglican clergyman. "Two great discoveries have transformed our view of the natural world. One is Einstein's theory of special relativity; the other is quantum mechanics....much the more revolutionary". He describes somewhat simply and very carefully "a way of thinking about the quantum world....and also the beautiful structure of the microworld which has been laid bare by the discoveries of elementary particle physics".

"CONTROL OF LEAF GROWTH" edited by N. R. Baker, W. J. Davies & C. K. Ong, xii & 351 pp., 81 b/w fig., 2 b/w photo. & 24 tab. Cambridge University Press, Cambridge & London, U.K. & New York, N. Y. 10022. 1985. \$39.50.

This neatly typed offset publication is No. 27 in the seminar series of the Society for Experimental Biology and contains 15 papers by 24 authors including the editors. They deal with such topics as: physical limitations of leaf cell expansion, energy transduction, carbon relations in developing leaves, mechanisms of light-stimulating leaf cell expansion, and air pollution and leaf growth with certain compensation mechanisms increasing the relative leaf area

exposed to ozone and sulfur dioxide. The figures on pp. 126 and 322 are particularly well constructed. The last paper, on "The Way Ahead", concludes that "Only by considering the whole plant can we identify the performance criteria which the control mechanisms associated with leaf growth may be trying to satisfy". Although most of the authors are from the British Isles, there is international representation among them.

"TIGER -- Portrait of a Predator" by Valmik Thapar, 200 pp., 175 color & 1 b/w photo. & 2 color maps. Facts on File Publications, Inc., New York, N. Y. 10016. 1986. \$24.95.

This is an excellent nature story rendered in effective words and in superb color photography by Günther Ziegler and Fateh Singh Rathore. It "shows and tells" of all phases of tiger life and activities, their prey, and of the other animals and plants that live in the beautiful Ranthambhore preserve with its ancient crumbling fort. Previously the English and maharajahs used to hunt here, causing the surviving tigers to hunt by night, but now they roam freely in daylight. There are appendices (1) locating (Asia), describing (subsp.) and censusing (ca. 7,000) the tigers of the world; (2) listing the mammals, reptiles and birds of this 400 km. forest; and (3) mentioning 450 named plant species and a profusion of insect life. Upon closing this book, I am sure that almost all readers will at least dream of visiting the Ranthambhore Tiger Preserve and will open their pockets for contributions to help the excellent nature conservancy work being performed there.

"SULFUR DIOXIDE AND VEGETATION - Physiology, Ecology, and Policy Issues" edited by William E. Winner, Harold A. Mooney & Robert A. Goldstein, xxi & 593 pp., 148 b/w fig., 74 tab., 2 maps & 8 photo. Stanford University Press, Stanford, California 94305. 1986. \$65.00.

"This volume was developed from a symposium held in Alisomar, California in 1982" and consists of 30 papers by 50 contributors. There are 4 papers on pollution management, 7 on sulfur dioxide effects on plant metabolism, 10 on its effects on plant growth, 7 on plant communities, and 2 in summary. It is intended as a reference book for those interested in sulfur dioxide-caused changes in plant physiology and ecology. Sulfur dioxide is only one of several industrial pollutants; it has been playing its destructive role longest and most intensely, as shown on a U.S.A. map on p. 235. Olson and Sharpe provide a rationale for the use of mechanistic mathematical modeling providing "vital links between long-term ecological, whole-plant dose-response, and biochemical mechanism research". This book is needed in agricultural, horticultural and biochemical labs and university libraries.

"GENETIC FLUX IN PLANTS" edited by B. Hohn & E. S. Dennis, xii & 253 pp., 40 b/w fig., 7 tab. & 16 photo. Springer-Verlag, Wien & New York, N. Y. 10010. 1985. \$39.00.

This is the second publication in the new Plant Gene Research [for] Basic Knowledge and Application and should be welcomed. Section I deals with movement of genetic information from the environment into the plants by competent and satellite viruses and viroids and of DNA flux across genetic barriers by *Agrobacterium*. Section II covers movement of genetic information between such plant organelles as chloroplasts with mitochondria or with nuclei. Section III has 6 papers on the movement of genetic information within plant organelles with consideration of "the very large and variable size of the genome", repeated DNA sequences, and unstable mutations and chromosome breakage in maize. The last chapter deals with the great amount of somaclonal variation (rather than presupposed uniformity) in tissue culture and gross plant study of several vegetable crop plants. Since this book shows where and how such research is headed and its possible economic applications, it surely belongs in university, college and effected laboratory libraries.

"THE EUROPEAN GARDEN FLORA - A Manual for the Identification of Plants Cultivated in Europe, Both Out-of-Doors and Under Glass": Volume I *Pteridophyta, Gymnospermae, Angiospermae-Monocotyledons* (Part 1) edited by S. M. Walters, A. Brady, C. D. Brickell, J. Cullen, P. S. Green, J. Lewis, V. A. Matthews, D. A. Webb, P. F. Yeo & J. C. M. Alexander, xv & 430 pp., 44 b/w multi-fig. pl. & 1 European hardiness lines map. Cambridge University Press, Cambridge & London, U. K. & New York, N. Y. 10022. 1986. \$99.50.

Limited to the huge field of amenity horticulture, this publication and its anticipated Volume II (and III?) on the rest of the monocots and the dicots will prove a great boon for literate owners of and workers in small garden spots to estate lands, from public building grounds to parks, for nurserymen to landscape architects, for conservatory to glass house growing laboratory staff, and for libraries with horticultural identification questions to the laboratory scientists and graduate trainees doing important experimental work on tomorrow's amenity plants with new forms, disease resistance, gene control, etc., and for the staffs of horticultural and mixed herbaria. Over 12,000 kinds of plants are named, fitted into operable keys, described within their families, with blooming times and cultivation tips, by a staff of 33 specialist-contributors. Since horticultural introductions encompass much of the globe, this book is surely destined to be a treasurehouse for English-language readers. It should fulfill an important place in private and public libraries as well as in those of horticultural schools and institutes, colleges and universities. This book is really a very special and valuable publication.

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NEW TAXA OF VENEZUELAN ARACEAE

George S. Bunting

A new revision of the Venezuelan Araceae undertaken since the publication of my *Sinopsis de las Araceae de Venezuela* (1979), has demonstrated the even greater diversity of the aroids in that country. Studies of recent collections, mostly from previously unexplored areas of Venezuela, have revealed a number of taxa new to science; the recognition of other taxa has resulted from the definitive study of some older collections. A number of the specimens cited here were made available for my study by the Herbario Nacional de Venezuela [VEN], the Herbario Ovalles of the Facultad de Farmacia, Universidad Central de Venezuela [MYF], and the Instituto Universitario de Tecnología in Coro, Falcón [IUTC]; others are material resulting from my own field work. The herbarium of the Jardín Botánico de Maracaibo is here cited as VZM.

ANTHURIUM

***Anthurium* *aroense* Bunt., sp. nov. (Fig. 1)**

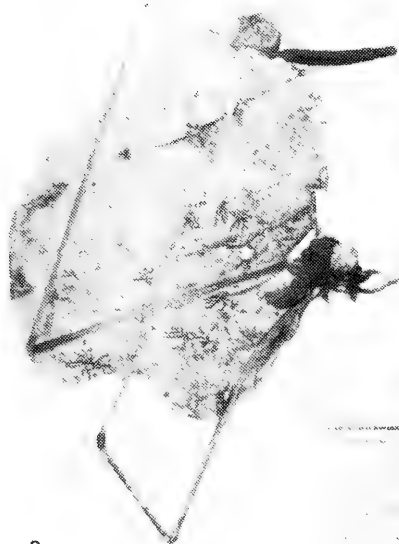
A. pariensi Bunt. primo aspectu maxime simile, sed foliorum lamina tantum subcoriacea haud cartilaginea, paribus duobus nervorum lateralium e basi costae ascendentibus vix validioribus quam nervis lateralibus ceteris e costa abeuntibus, spadice breviter stipitate (in illa sessili) floribus 4 in quaque spira primaria (in illa 7) et 5 in quaque spira alterna (in illa 12) visibilibus.

TYPUS: R. Liesner & Angel González 9824. Epiphyte. Spathe green, tinted with red-purple. Spadix purple-brown, becoming greenish. Peduncle round. Primary forest; Cerro Negro, 8 km SW of San Felipe, 10°17' N., 69°1' W., Sierra de Aroa, Edo. Yaracuy, 1200-1800 m, 1-2 April 1980 [Holotypus: VEN].

***Anthurium* *berryi* Bunt., sp. nov. (Fig. 2)**

A. tamaensi Bunt. simile, sed differt foliorum lamina chartaceo-pergamena (in illa subcoriacea) et nervatione minus prominente, nervo colectivo ad marginem approximatiore, petiolo proportionem breviori (respectu lamina), spathe spadiceque minore, spathe vix oblique affixa et non decurrenti.

TYPUS: Charles W. Wood & Paul E. Berry 95. Terrestrial herb. Stem lustrous, green-brown, pith white-pink. Petiole same color as stem. Leaf lustrous dark green over light green. Bract [spathe?] lustrous green flushed brownish rose. Male spathe [spadix in anthesis?] dark purple-brown, female spathe [spadix post-anthesis?] green with brownish tips on flowers. Among moist, mossy rocks in deeply shaded quebrada; headwaters of Río Guasare, "Campamento Frontera V", 10°23'7.8" N., 72°52'45.5" W., on international boundary, Edo. Zulia, 2700-3300 m, 20-23 July 1974 [Holotypus: VEN].



Anthurium guanchezii Bunt., sp. nov. (Fig. 3)

Herba terrestris ut videtur non scandens. Caulis internodiis brevissimis 2.5 cm crassis (in sicco) cataphyllorum reliquiis persistentibus. Petiolus 30 cm longus parte vaginata 1.7 cm longa; geniculum 0.8-1 cm longum. Foliorum lamina pergamenata vel semicoriacea (in sicco) ambitu ovata 33.5 cm longa 22.5 cm lata, ad basin sinuata sinu 1.8 cm profundo, ad apicem sensim acuminata (2.5 cm), abaxiale fusco-punctata, costa per 4.5 cm inferiora nuda (i.e. sine lamina) plus minusve cylindrica attamen adaxiale anguste canaliculata, nervis lateralibus primariis tenuibus prominentibusque utrinque ca. 8 sub angulo ca. 40° (2-3 paribus infimis sub angulo majore) abeuntibus. Pedunculus 58 cm longus. Spatha ovata minimum 9 cm longa 2.5 cm lata patento-recurvata, basi decurrente (1.2 cm) apice acuminata. Spadix stipitatus stipite postice 0.4 cm antice 1.7 cm longo, 8.2 cm longus (in specimine; ut videtur apice carenti) 0.7 cm crassus (sub fructu 1.1 cm crassus).

TYPUS: Francisco Guánchez & E. Melgueiro 3451. Terrestre; espádice con frutos color aceituna cuando inmaduros. Muy frecuente en todo el bosque bajo ralo (B3r); transecto desde matorral ribereño hasta bosque bajo ralo, en la margen izquierda del caño Cabeza de Manteco, afluente del río Autana, en el raudal "Manteco", 4° 52' N., 67° 27' O., Depto. Atures, Territorio Federal Amazonas, 110-120 m, 10 de noviembre, 1984 [Holotypus: VEN; isotypus: VZM].

Anthurium huequeense Bunt., sp. nov.

Differt a A. crassinervio (Jacq.) Schott statura minore, petiolo abaxiale rotundato, spatha viridi et persistenti, spadice sub anthesi viridi tandem vinaceo-suffuso.

TYPUS: George S. Bunting 7704. Terrestre. Rizoma horizontal, entrenudos muy abreviados con numerosas raíces adventicias gruesas y grisáceas. Pecíolo semiterete, adaxialmente canaliculado, abaxialmente a veces 3-carinado. Lámina bien lisa, nervio medio anguloso-convexo adax., abax. como pecíolo. Inflorescencia toda verde en anthesis; espata cochleariforma, extendido-ascendente, luego circinada; espádice verde en anthesis, luego teñido morado. Cultivada en el Jardín Botánico de Maracaibo, de una planta traída por H. v.d.Werff recolectada en matorral siempreverde con Capparis spp. y Geoffroea, en el delta del río Hueque, carretera Coro-Morón, 100 km al este de Coro, Dto. Zamora, Edo. Falcón, 50 m, 12 de julio, 1985 [Holotypus: NY; isotypus: VEN].

Anthurium longissimum Pitt. subsp. **nirguense** Bunt., subsp. nov. (Fig. 4)

A subsp. longissimo petiolis pedunculisque longistrorsum sulcatis, foliorum segmentis proportionem latioribus, nervis principalibus in superficie abaxiali atque cataphyllis petiolis pedunculis spathisque praesertim in organis novellis cupreo-purpureo- vel malvacei- vel brunneo-suffusis dignoscenda.

TYPUS: Julian A. Steyermark & George S. Bunting 97722. Stem 1.3 m long, clinging tightly to tree trunk, internodes short, one

cm or less long; spathe coppery red-purple abaxially, creamy suffused red-purple adaxially, reflexed, 5 x 3 cm; spadix 5 cm long, 2.1 cm diam. throughout, buff in development. Selva nublada en la fila del Cerro La Chapa, al norte de Nirgua, Edo. Yaracuy, 1200-1360 m, 11 de marzo, 1967 [Holotypus: VEN].

***Anthurium perijanum* Bunt., sp. nov. (Fig. 5)**

A. subsagittato (HBK) Kunth affine, a quo imprimis differt foliorum lamina longiore ad 45 cm longa et 16 cm lata, proportione angustiore (in hac 2.8:1, in illa 1.4-2.3:1), forma plus minusve oblonga lobis posticis minus patentibus.

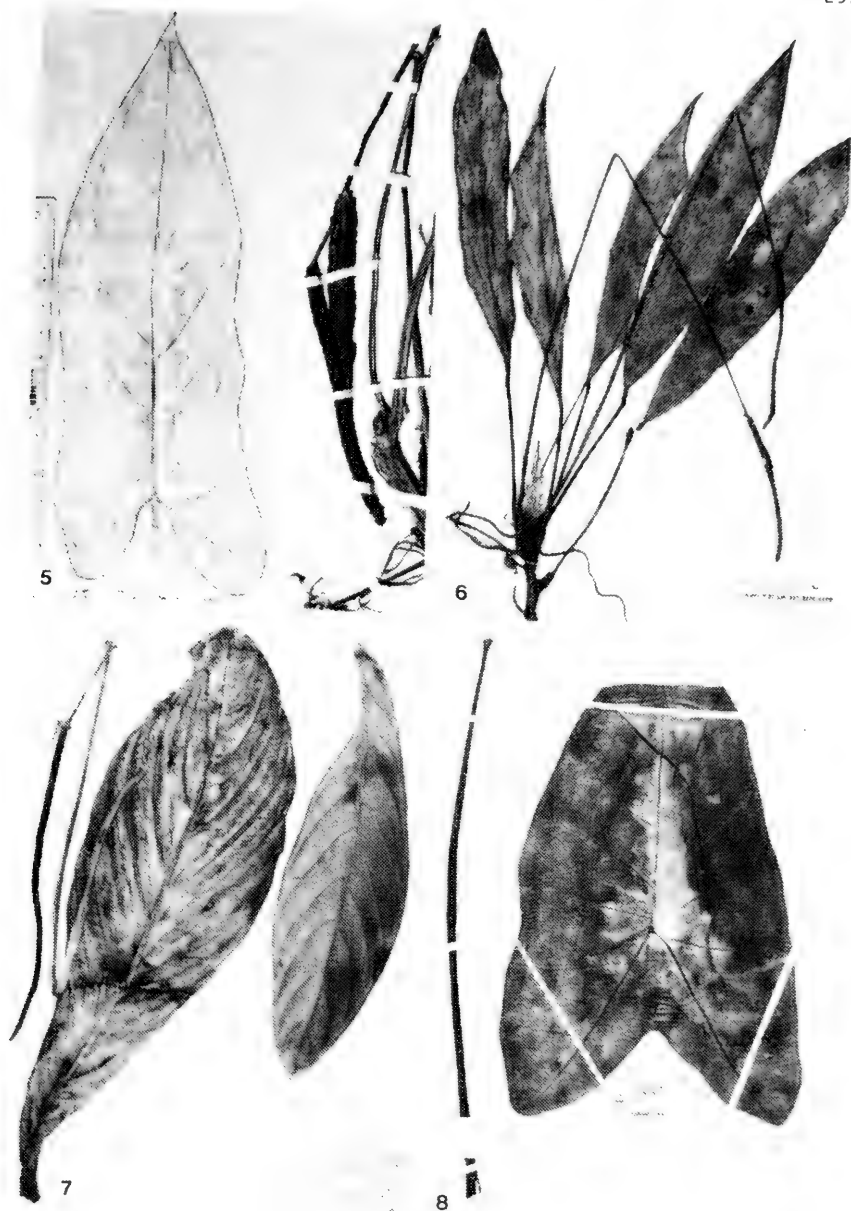
TYPUS: Julian A. Steyermark, G.C.K. & E. Dunsterville 105560. Climbing; spathe revolute in 2 spirals, 10-12 x 2.1 cm, pale green turning dull yellow; spadix dull green, 15-18 x 1.1 cm. Bosque húmedo; a lo largo de la quebrada del río Omira-kuná (Tumuríasa), cerca de la frontera colombo-venezolana al suroeste de Pishikakao e Iría, Sierra de Perijá, Edo. Zulia, 1440-1460 m, 22-23 y 28 de marzo, 1972 [Holotypus: VEN].

***Anthurium subscriptum* Bunt., sp. nov. (Fig. 6)**

Herba humilis terrestris vel epiphytica. Caulis 0.7 cm crassus internodiis 1.5 cm vel minus longis paucis radicibus adventitiis gracilibus. Cataphyllum ca. 5 cm longum mox in fibras grossas brunneas pallidulas dissolutum et amittens. Petiolus ut videtur adaxiale sulcatus, nigrescens (in sicco) 8.5-11 cm longus parte vaginata lata ca. 1 cm longa; geniculum ca. 0.8 cm longum. Foliorum lamina plus minusve coriacea (in sicco; in vivo probabiliter carnosae), anguste elliptica parum obovata, e medio uterque extremitatem versus attenuata, ad basim plus minusve cuneata, 17.5-23.5 cm longa 3.8-4.1 cm lata, adaxiale nervis haud manifestis costa et nervis collectivis tantum per sulcos angustatos notatis (in sicco), abaxiale conspicue copioseque brunneo-punctata nervatione conspicua costa quam nervis ceteris validiore, nervis lateralibus I. utrinque 5 sub angulo ca. 20° abeuntibus in nervum collectivum e basi ad apicem currentem a margine 0.5 cm remotum conjunctis. Pedunculus 34-37 cm longus rubro-brunneus (in sicco). Spatha pusilla gracilis demum 2.1 cm longa (in specimine), brunnescens. Spadix stipitatus stipite postice 0.2 cm antice 0.6 cm longo, brunnescens 8.3-9 cm longus 0.3-0.5 cm crassus floribus 3 in quaque spira primaria et 5 in quaque alterna.

TYPUS: Francisco Guánchez & E. Melgueiro 3443. Hierba terrestre, a veces epífita a un metro de suelo; espádice y espata marrón tierra cuando maduros. Muy frecuente en todo el bosque (B3T); transecto desde matorral ribereño hasta bosque ralo, en la margen izquierda del caño Cabeza de Manteco, afluente del río Autana, en raudal "Manteco", 4°52' N., 67°27' O., Depto. Atures, Territorio Federal Amazonas, 110-120 m, 10 de noviembre, 1984 [Holotypus: VZM; isotypus: VEN].

This species appears to be related to *A. friedrichsthali* Schott, of Central America.



Anthurium xanthoneurum Bunt., sp. nov. (Fig. 7)

A speciebus rosulatis similibus differt combinatione petiolorum brevissimorum usque ad basim laminae vaginatorum cum foliorum laminis rigide crasso-coriaceis amplitudine comparate parvae abaxiale conspicue brunneo-punctatis adaxiale nitidissimis costa et nervis lateralibus l. flavis.

TYPUS: Julian A. Steyermark, Paul Berry & Francisco Delascio 130054. Acaulescent; leaves stiff-coriaceous, deep green above with sulcate or impressed yellow lateral nerves and elevated yellow midrib, lower side with elevated nerves and midrib; spadix brownish green. On igneous rock outcrops; piedra ígnea, Cerro Aratitiyo, 2°10' N., 65°34' O., aprox. 70 km SSO de Ocamo, con ríachuelos afluentes al río Manipitare, Depto. Río Negro, Territorio Federal Amazonas, 990-1670 m, 24-28 de febrero, 1984 [Holotypus: NY; isotypus: VEN].

CALADIUM**Caladium aturense** Bunt., sp. nov. (Fig. 9, 10)

Herba acaulescens. Cormus 4 cm diam. 3.5 cm crassus carne alba. Petiolus 68-71 cm longus 0.6 cm diam. (in medio), saltem supra medium brunneo-atropurpureus vel roseo-brunneus perpallidus et brunneo-suffusus. Foliorum lamina membranacea peltata ambitu subtriangularis (sagittata) 34-41 cm longa usque 27 cm lata (trans lobos posticos), in loco insertione petioli fere opposito margine latere altero contracto; lobus anticus triangulari-ovatus usque 17.5 cm latus (in loco 3-5 cm supra insertione petioli) inde angustatus apice breviter acuminatus, nervis lateralibus l. utrinque 3 validis (centrali sub angulo 35-45° abeunti inferiore latius extenso) in nervum collectivum a margine 0.3-0.9 cm remotum conjunctis; lobi postici ambitu anguste triangulares interdum marginibus sinuatis saepe divaricati 14-21.5 cm longi 6-7 cm lati per 2.2-4 cm proximalia connati inde attenuati apice ipso obtusi sinu subtriangulari 11.3-13.3 cm longo sejuncti; lamina adaxiale smaragdina glaucescens interdum (i.e. in stirpe sterili fortasse juvenili) cremeo-maculata, abaxiale ex argenteo cyano-viridis interdum purpureo-suffusa. Pedunculus 38 cm longus viridis deorsum versus cremicolor striis griseo-brunneis notatus. Spatha (caudicula terminali 1.5 cm longa inclusa) 10 cm longa, tubo 4.3 cm longo extra impolito viridi postice paulo glauco intra griseo-viridi atamen per 0.3-0.5 cm basalia purpureo, limbo in ambabus superficialibus albo.

TYPUS: George S. Bunting, L.M.A. Akkermans & J. van Rooden 3480. Cormous herb. Corm 4 cm diam., 3.5 cm deep, white inside. Leaves glaucescent and emerald green adax., abax. pale gray-green to suffused purplish. Petiole brown-dark purple or tan strongly suffused dark brown, slender, to 6 mm at midpoint. Some leaves mottled creamy. En sabana con manchas ocasionales de bosque; entre Puerto Ayacucho y km 35 hacia Sanariapo, Depto. Atures, Territorio Federal Amazonas, 100-140 m, 6-19 de julio, 1969 [Holotypus: NY; isotypi: K, MY, U].



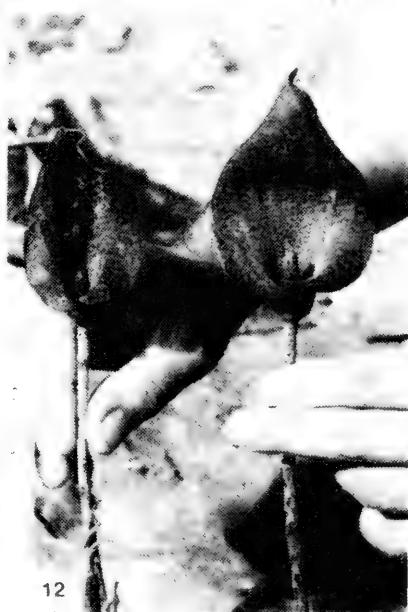
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12

PARATYPUS: Francisco Guánchez 2852. Hierba creciendo sobre suelo orgánico en el afloramiento rocoso, en lugar sombreado, aislada y poco frecuente (UL); margen izquierda del río Guayapo, en el raudal Moriche, transecta de dirección norte, pasando por el bosque ribereño-afloramiento granítico o laja-bosque medio denso, 4°24' N., 67°32' O., Depto. Atures, Territorio Federal Amazonas, 110 m, 14 de julio, 1984 [VEN].

Caladium steyermarkii Bunt., sp. nov. (Fig. 8)

Herba acaulescens cormosa. Petiolus validus (0.29-)0.46-1.0 m longus, quam lamina fere duplo longior, ex brunneo vel sordide vinaceo-roseo viridis parte vaginata (5-)11-16 cm longa. Foliorum lamina tenuis peltata ambitu ovato-triangularis 25-40 cm longa 16-24 cm lata apice acuminata, ad basim subsagittata, adaxiale impolita saturate viridis glaucescens vel coeruleo-grisea maculis griseis inter nervos laterales I. notata, abaxiale argentea vel griseo-glaucous et violaceo-suffusa nervis omnibus violaceis; lobus anticus secus costam 16-26 cm longus nervis lateralibus I. utrinque 4-5 centralibus sub angulo ca. 40-50° abeuntibus; lobi postici quam anticus ca. duplo breviores, ovato-triangulares per 4.3-6.6 cm basalia connati, ad apicem angulares apice ipso valde obtusi sinu aperto triangulari 4-7 cm profundo sejuncti; nervi principales omnes in nervum collectivum e basi ad apicem currentem a margine 0.3-0.5 cm remotum conjuncti. Pedunculus 26-34 cm longus. Spatha 10-12.5 cm longa tubo 3.8-5 cm longo extra viridi et griseo-glaucous limbo e viridi luteolo-cremicolori, intra tubo viridi limbo fere albo.

TYPUS: Julian A. Steyermark, George S. Bunting & Carlos Blanco 102035. Leaves purplish beneath. Just south of Río Borgüita¹, Edo. Apure, 9 de abril, 1968 [Holotypus: VEN].

PARATYPI: George S. Bunting 4488. Cormous herb ca. 0.8 m tall. Petiole green strongly mottled brown. Leaf blade adax. matte dark green & glaucescent with largish gray blotches between primary lateral veins; abax. gray-glaucous, suffused violet, with midrib, lateral veins & veinlets all violet. Spathe limb outside yellowish cream with greenish cast, inside near-white, tube green & gray-glaucous. Grown from corm of type collection, Steyermark et al. 102035, cultivated in the Facultad de Agronomía, Universidad Central de Venezuela, Maracay; specimen prepared 17 June 1971. Origin of corm: between San Camilo (El Nula) and the Río Sarare, ca. 2 km upstream from south bank of Río Nula, Selva de San Camilo, Edo. Apure, 280 m [VEN].

Julian A. Steyermark & Marvin Rabe 96621. Terrestrial; leaf blades silvery beneath, bluish green above; petiole dull wine-rose; spathe blue-green with the upper narrowed part paler blue-

¹ fide label, but this datum is erroneous; the correct collection locality is that cited in the following paragraph under "PARATYPI: George S. Bunting 4488".

green (not mature). Swampy rill along wet forest, between Piscurí and Ayarí [approx. km 60 of the San Cristóbal-Barinas highway], Edo. Táchira, 175-200 m, 26-27 de agosto, 1966 [VEN].

DRACONTIUM

Dracontium aricuaisanum Bunt., sp. nov. (Fig. 11, 12)

Herba acaulescens usque ad 1.5 m alta. Cormus obovoideus 4-6 cm diam. 3.5-4 cm crassus carne alba, in margine superiore cormulos obovoideos (1.5 cm longos 0.9 cm diam.) ferens. Cataphyllum 9 cm longum. Folium solitarium plerumque post anthesin prodiens. Petiolus teres 0.47-1.2 m longus basi 1.6 cm diam., nigro-viridis vel brunneus vel griseo-olivaceus maculis diagonalibus pallide griseis notatus et spinescens. Foliorum lamina ambitu ovato-circularis tripartita fenestris numerosis irregulatim ellipticis ut in *Monstera* perforata abaxiale interdum purpureo-suffusa, quoque segmento petiolulato (petiolulo griseo sat ascendenti) irregulatim bi- vel tripinnatifido segmento centrali 25-43 cm longo 14-35 cm lato divisionibus majoribus usque ad 24 cm longis, segmentis lateralibus centrali similibus. Pedunculus saepe praecox 14-25 cm longus (sub fructu usque ad 39 cm longis) asperus maculis alternatim olivaceo-nigris et griseis interdum roseo-suffusis notatus. Spatha subovata usque ad 11-15 cm longa, per 1.5-3 cm basalia convoluta in tubum infundibuliformem ad 2.5 cm latum formata, sursum in limbum 5.5-7 cm latum complanata, ad apicem acuminata, in ambabus superficiebus impolita ex olivaceo vel nigro-olivaceo vinacea vel brunnea, adaxiale dense et subtilissime albo-pilosula velut farina obducta nervis verticalibus ca. 9, denique caduca. Spadix tubum spathae superans, sessilis vel stipitatus stipite 0.8 cm longo, 1.8-2.4 cm longus 0.8 cm diam., ejusdem coloris quam spatha. Filamenta diaphana et viridula; antherae pallide violaceae. Pistillum album apice purpureum; ovarium 3-4-loculare loculis uniovulatis. Infructescentia nuda ellipsoidea superficie laevi fructuum marginibus vix manifestis, ad 4 cm longa 3.8 cm crassa in stipite ca. 1 cm longo. Baccae (immaturae) apice truncatae nigro-virides ad 1.3 cm crassae. Semina apostrophiformia porcis dorsalibus interruptis, 0.7 cm longa 0.5-0.55 cm lata.

TYPUS: George S. Bunting, Guillermo Panapera & Henry Lobo 10866. Hierba terrestre; cormo obovoide, blanco adentro, 4 cm diám., 3,5 cm de espesor. Pecíolo y pedúnculo ásperos y marcados en modo diagonal con ceniciento y griseo-oliváceo. Espata vino tinto intenso o apagado, con escamitas como polvo blanco, nervios 1. ca. 9 más o menos destacados y más o menos arrugada entre ellos. Pecíolo x 1,2 cm por debajo, x 0.6 cm por arriba. Zona de bosque siempreverde; en orilla boscosa del río Aricuaisá, alrededores de la Estación Hidrológica Aricuaisá-Pie de Monte, 9°35'30" N., 72°53'55" O., Dtto. Perijá, Edo. Zulia, 100-250 m, 25 de febrero-3 de marzo, 1982 [Holotypus: NY; isotypus: VEN].

PARATYPUS: George S. Bunting, Guillermo Panapera & Jorge Trujillo 11463. Hierba cormosa. Pecíolo veteado con verde oliváceo y gris negruzco, raquis de hoja iguales; lámina más o menos lustrosa

esp. en envés; pedúnculo como petíolo. Frutos trancos, verdes ne-gruzcos. En zona de bosque siempreverde; en orilla boscosa del río Aricuaisá, alrededores de la Estación Hidrológica Aricuaisá-Pie de Monte, 9°35'30" N., 72°53'55" O., Dtto. Perijá, Edo. Zulia, 100-250 m, 1-3 de mayo, 1982 [NY, VZM].

Dracontium changuango Bunt., sp. nov. (Fig. 13, 14)

Herba magna acaulescens usque ad 2.4 m alta. Cormus sub-hemisphaericus infra rotundatus 11-17 cm diam. 9 cm crassus, in margine superiore cormulos ovoideos ferens. Cataphyllum ad 24 cm longum. Folium bene post anthesin prodiens, solitarium umbracu-liforme. Petiolus teres 0.90-2.05 m longus deorsum 4-7 cm diam. prope apicem 1.8 cm diam., brunneus vel nigro-olivaceus vel purpureo-niger maculis brunneolis griseis vel sordide albis no-tatus, praesertim sursum processibus parvulis spinescentibus 0.1-0.2 cm longis praeditus; pars vaginata 11-26 cm longa. Foliorum lamina ambitu ovato-circularis usque ad 1.2 m lata tripartita paulo succulenta (in sicco tenuiter membranacea) adaxiale nitida abaxiale pallide viridis nitidissima interdum fenestris ellipticis perforata ut in *Monstera*, quoque segmento petiolulato (petiolulo patenti maculato spinescenti petiolo simili) irregularit bi- vel tripinnatifido, segmento centrali 44-72 cm longo 31-69 cm lato di- visionibus majoribus ad apicem interdum bifidis, lobulis ultimis ovatis vel obovatis magnitudine variantibus usque ad 11 cm longis 5 cm vel ultra latis, segmentis lateralibus centrali similibus. Inflorescentiae solitariae raro binae multum ante folia prodeun- tes. Pedunculus subterraneus 9-17 cm longus albus interdum roseo- suffusus cataphyllo 9-12.5 cm longo demum siccanti et persistenti subtentus. Spatha per 1 cm basale interdum subterranea, infra medium convoluta tubo subconico, sursum cochlearis vel cucullata ad apicem erecta vel incurvata, 4-10.5 cm longa, in positione nat- urali tubo 2.5-4 cm longo 2.3-3 cm lato limbo 3.5-6 cm lato, extra impolita ex nigro-purpureo olivacea apicem versus olivacea vel ex brunneo olivacea basim versus brunneola nervis verticalibus principalibus 5-9 luteo-viridibus, intra impolita intense rufo- vinacea vel nigro-olivacea praesertim deorsum pilositatibus minu- tis albis vel cinereis ut videtur farina obducta. Spadix tubo spathae vix longior, stipitatus stipite 0.1-0.3 cm longo, 2.2-3 cm longus 1-1.3 cm diam. sordide brunneolus vel brunneus vel roseus stigmatibus mox paulo exsertis, ad extremitatem processus 1-3 in- fundibuliformes vel petaloideos olivaceos vel violaceos usque ad 0.55 cm longos 0.4-0.7 cm latos gerens. Tepala 6-7 viridi-alba ad apicem viridia violaceo- vel brunneolo-punctulata. Pistillum viridi-luteum ad apicem violaceo- vel brunneolo-punctatum; ovarium (4)-5-6-loculare loculis uniovulatis. Infructescentia stipitata stipite 1.7 cm longo, cylindrica 16 cm longa 5 cm diam. (fere ma- tura) viridis denique vinaceo-brunnea fortasse brunneo-aurantiaca, spatha sicca etiam post liberationem baccarum persistenti. Baccae 4-6-angulares subturbinatae (a latere visae obovatae) apice truncatae centraliter concavae ca. 1.7 cm altae 1.5 cm crassae brunneolo-albae apice fuscae. Semina apostrophiformia dorsaliter

porcata ubique valde verruculosa vel verruculoso-squamata, aurantiaco-brunnea, 0.7-0.9 cm longa 0.6-0.7 cm lata.

TYPUS: George S. Bunting 2856. Inflorescences only produced at this season. Peduncles below ground, and base of spathe as well. Peduncle rosy to white, to 9 cm long, in young infls. with pale pink cataphyll to 9.5 cm long drying in age and persisting. Spathe to 10.5 cm long, convolute basally, cucullate to spoon-shaped upward, outside olive-brownish becoming brownish toward base, nerves yellowish green (4 on each side of midrib), ridged along midrib; inside dark maroon-wine covered especially downward with white "dust" (pilosities). Young spadix dull tan or with apices olive-buff, creamy at base, upper flowers with violet anthers; anthesis appears to start at apex and proceed downward; apically with olive-greenish to violet processes, open and petal-like or tubular and funnelform or variously contorted; spadix to 3 x 1.3 cm; stipe stout, brownish or rosy. A suggestion of fetid odor at night. En bosque semideciduo; al lado de la carretera, Caño Paso Ancho, ca. 6 km al sur de Valencia, cerca de El Paito, Edo. Carabobo, ca. 450 m, 22 de enero, 1968 [Holotypus: MY; isotypus: NY].

PARATYPI: George S. Bunting & Baltasar Trujillo 2221. Herb to 2.4 m tall, umbrella-like. Corm to 17 cm diam. Petiole brown with paler splotches & rather few, spine-like excrescences 1.2 mm long esp. upward; 4 cm thick toward base; petiolules like petioles. Leaf blade to 1.2 m diam., glossy rich green adax., very pale & glossy abax. Fruits to 1.7 cm long, 1.5 cm thick, obovoid, dirty brown at apex, tan-white below. In half-shade in wet, roadside woods near caño, inundated in this season; ib. ut typus, 12 August 1967 [MY]; George S. Bunting & Baltasar Trujillo 2224. Ib. ut typus, 12 August 1967 [NY].

George S. Bunting 4432. Only infructescences present (without foliage), apparently near maturity, to 16.5 cm long and 5 cm thick, stipe 1.5 x 1.5 cm, it and axis of spike pinkish or greenish white, old spathe persistent but dry; with ca. 170 fruits in the largest spadix. Fruits dark brown or green-dotted with brown on apex, each one well defined, outer margins angular, apically flat but for a central concavity; fruits of different lengths (surface of spike thus irregular), to 1.7 x 1.6 cm, becoming green downward and finally white in basal half. En zona boscosa volviéndose pantanosa durante la temporada de lluvias; ib. ut typus, 16 de mayo, 1971 [MY].

Common names: changuango (Carabobo, Guárico); cuma pan (Bolívar). The corm is said to be edible when cooked.

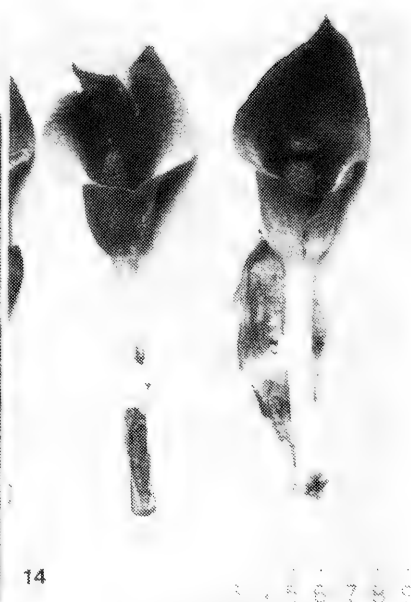
HETEROPSIS

Heteropsis spruceana Schott var. **robusta** Bunt., var. nov. (Fig. 15)

A varietate typica foliis majoribus proportione latioribus differt. Petiolus 0.3-0.7 cm longus, geniculum 0.2-0.4 cm longum.



13



14



15



16

Foliorum lamina (acumine 1.2-3.2 cm longo incluso) 11-20 cm longa, 4.2-7.7 cm lata proportione inter longitudinem et latitudinem 2.3-3.6:1 (in varietate typica 3.2-5.4:1).

TYPUS: Francisco Guánchez 61. Utilizadas para amarre de viviendas, confección de tejidos y fabricación de muebles, etc. En manchas, muy frecuente. Bosque alto denso a aprox. 1 km al norte de San Pedro de Cataniapo, a unos 60 km al NE de Puerto Ayacucho, 5°39' N., 67°11' O., Depto. Atures, Territorio Federal Amazonas, 90-110 m, 4 de agosto, 1980 [Holotypus: MYF].

PARATYPUS: Francisco Guánchez 283. Trepadora con raíces aéreas colgantes lignificadas, utilizadas como atadura por los lugareños; frutos color naranja, ovalados, de 1.2 cm de largo x 0.9 cm de diámetro, hojas papiráceas; hasta alturas de 20-25 m; localmente muy frecuente. En bosque alto medianamente intervenido; a 2 km al noroeste del caserío San Pedro de Cataniapo, a unos 60 km al sureste de Puerto Ayacucho, 5°38' N., 67°12' O., Depto. Atures, Territorio Federal Amazonas, 100 m, 4 de noviembre, 1980 [MYF].

Common names: mamure (Spanish); kiyowipo (Piaroa, along Río Cataniapo).

***Heteropsis steyermarkii* Bunt., sp. nov. (Fig. 16)**

Herba usque 7 m scandens. Caules multum ramosi, lignei tenacissimi 0.35-0.6 cm crassi virides postremo brunnescentes scabrelli internodiis 0.3-3 cm longis, gemmis lateralibus longe exsertis (0.3-0.4 cm). Petiolus 3-6.7 cm longus, basi geniculi tenus vel ultra vaginatus alis stantibus attamen marginibus involutis denique siccantibus brunnescentibus persistentibus; geniculum 0.5-1.7 cm longum. Foliorum lamina pergamena vel subcoriacea autem fragilis oblongo-elliptica vel elliptica aut latissima paulo supra vel infra medium, interdum subfalcata 16-36 cm longa 4.6-10 cm lata, ad basim truncata vel rotundata, ad apicem acuta vel fere obtusa apice ipso acuminata, paululum corrugata, adaxiale impolita nitescens, nervis lateralibus numerosis subaequalibus 0.3-0.4 cm inter se distantibus sub angulo 55-75°(-82°) oreuntibus marginem versus valde arcuatis, abaxiale grisea vel veneto-grisea vel argentea costa luteola; folia nova aenea abaxiale pruinosa. Inflorescentia solitaria terminalis (in ramo patenti vel pendulo 4-10 cm longo) erecta. Pedunculus 1.2-2.2 cm longus ad basim 1-2 bracteis sub anthesi viridibus deinde lutescentibus et caducis. Spatha fusiformi-inflata (acumine 0.2 cm longo incluso) 4.5-7 cm longa ca. 2.2 cm diam. (in positione naturali) 6 cm lata (ubi complanata) marginibus laxantibus vel paulo discedentibus tamen non aperiens, mox caduca, extra viridis vel ex luteo viridis, intra cremicolor. Spadix spinitatus stipite 1.0-1.4 cm longo, ambas extremitates versus angustatus 2.5-3.5 cm longus ad 0.8 cm diam., sub anthesi pallide viridis. Flores apice convexi. Infructescentia matura ad 4.7 cm vel ultra longa 1.5 cm crassa aurantiaca. Baccae ad 0.4 cm longae 0.3-0.7 cm crassae; semina 4-5 apostrophiformia brunnea perpallida foveolata, 0.35-0.38 cm

longa 0.2-0.27 cm lata.

TYPUS: Julian A. Steyermark & George S. Bunting 102607. Climber to 7 m up tree trunk with spreading and pendent branches to 6 mm diam., woody, green becoming brownish in age; lf. blade pergameneous-subcoriaceous, brittle, adax. glossy dark green, slightly corrugated by concavities along nerves, abaxially prominently light gray, rib green-yellow; spathe fusiform-inflated, to 7 cm long, 2.2 cm across, slightly parting but not opening, yellow-pale green outside, inside creamy, early deciduous; spadix 4 x 0.8 cm, light green in anthesis; mature infructescence 1.1 cm diam. A lo largo del río Yatua, margen izquierda, bajando desde el Cerro Araucagua, 1°35' N., 66°10' O., Depto. Río Negro, Territorio Federal Amazonas, 125 m, 11-12 de abril, 1970 [Holotypus: VEN].

PARATYPUS: Julian A. Steyermark & George S. Bunting 103056. Leaves silvery below, dark green above; spadix 3.5 x 1.4 cm, pale gray, apices of individual fruits slightly convex, ca. 4 mm diam. Cerro Yapacana, selva alta en la parte suroeste, desde el Campamento Base hasta las faldas pedregosas, 3°45' N., 66°45' O., Depto. Atabapo, Territorio Federal Amazonas, 125-400 m, 3 de mayo, 1970 [VEN].

Heteropsis tenuispadix Bunt., sp. nov. (Fig. 17)

Herba scandens. Caulis flexuosus 0.3 cm diam. internodiis 3.7-1.8 cm longis (e basi ad apicem), gemmis lateralibus modo emergentibus vel exsertis ad ca. 0.1 cm. Petiolus 0.5-0.8 cm longus; geniculum ca. 0.4 cm longum. Foliorum lamina semicoriacea (in sicco chartaceo-subpergamena), elliptica vel elliptico-obovata, 12-17.5 cm longa 4-7 cm lata, ad basim cuneata vel marginibus paulo rotundatis, ad apicem obtusa et abrupte acuminata (acumine 1.2-1.6 cm longo), nervis lateralibus principalibus 0.4-0.5 cm inter se distantibus sub angulo 63-70° abeuntibus in nervum collectivum a margine 0.1-0.2 cm remotum conjunctis. Rami floriferi laterales 4-6.8 cm longi nodis 3-5, aphylli praeter nodum summum folio parvo mox caduco. Pedunculus (i.e. axis inter folium et insertionem spathae) 0.3 cm longus. Spatha rostrata 2.5 cm longa 2 cm diam. (in sicco), alba. Spadix spatham aequans, stipitatus stipite gracili 0.5 cm longo, anguste ellipsoideus 2.3 cm longus 0.5 cm diam., initio laevis demum asperatus per stylos mamilliformes 0.05 cm longos, albus. Flores apice quadrati vel late rhombici inter margines parallelos 0.2 cm lati.

TYPUS: Paul E. Berry 2189. Epífita con espádice blanco. En bosque de tierra firme; a 3 km al sur de Trapichote, desembocadura del río Ventuari, Territorio Federal Amazonas, ca. 130 m, 28 de marzo, 1976 [Holotypus: VEN; isotypus: MYF].

PHILODENDRON

Philopsammus Bunt., sect. nov.

Cataphylla in situ siccantia plerumque longe persistentia. Petiolus plerumque plus minusve manifeste geniculatus; foliorum

lamina in petiolo arrecta, plerumque coriacea (in vivo), integra, oblonga vel elliptica vel ovata basi nec cordata nec lobis posticis bene formatis, nervis lateralibus omnibus subparallelis saepe primariis vix prominentibus interdum nervis omnibus subaequalibus. Flores pistillati ovario 2(-3)-loculari loculis multiovulatis, ovulis e basi ad apicem loculorum superpositis.

TYPUS: Philodendron ptarianum Steyerl., Fieldiana: Botany 28(1): 99. 1951.

Section Philopsammis pertains to the subgenus Philodendron Engl. and appears to have a distribution limited to the Guayana Highland, especially of Venezuela, with extensions into adjacent Guyana, Brazil, and Colombia. In general, the species of this section grow in white sand savannas, on sandstone outcrops, and on the tepuís, although P. phlebodes occurs in lowland forest of Territorio Federal Amazonas, and P. steyermarkii is widely distributed throughout the Guayana region.

The other known species of this section are:

- P. canaimae Bunt.¹
- P. dunstervilleorum Bunt.
- P. dyscarpium Schultes var. dyscarpium
- P. dyscarpium var. venturianum Bunt.¹
- P. peraiense Bunt.¹
- P. phlebodes Bunt.
- P. pimichinense Bunt.
- P. remifolium Schultes
- P. sabulosum Bunt.¹
- P. steyermarkii Bunt.
- P. tatei Krause subsp. tatei
- P. tatei subsp. melanochlorum (Bunt.) Bunt.¹

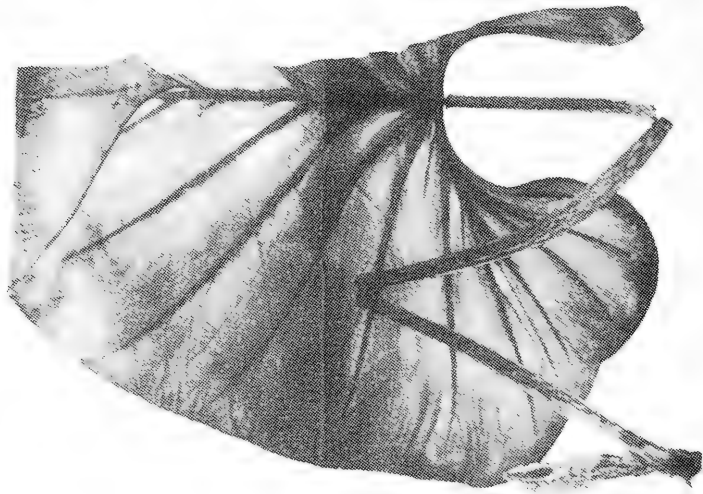
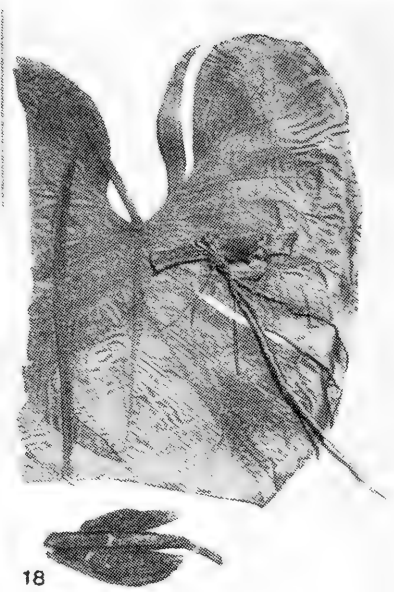
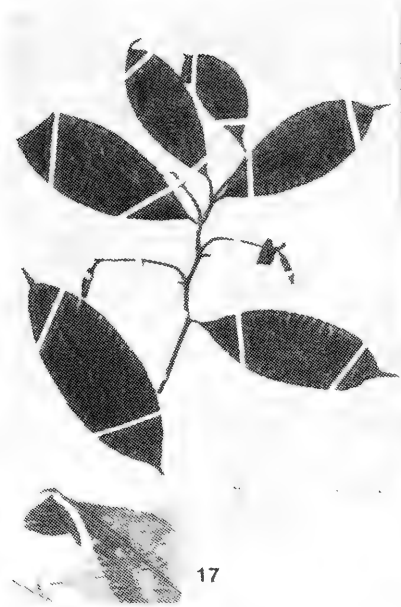
Philodendron callosum Krause may belong here, although it was originally described² as having a plurilocular ovary with the locules few-ovulate. Only a study of the type specimen will resolve the matter. If indeed it corresponds to this section, then P. ptarianum Steyerl. may become a synonym of P. callosum.

Philodendron amplisinum Bunt., sp. nov. (Fig. 19)

Herba scandens. Caulis usque ad 3 m longus 4-7 cm crassus internodiis valde abbreviatis, nudus praeter apicem cataphyllorum reliquiis fibrosis et siccatis tectus. Cataphyllum 22 cm longum. Petiolus solidus subteres ventraliter angulari-convexus vel deorsum planescens, 65-98 cm longus 1.7 cm crassus, niger (in sicco), parte vaginata 4-7 cm longa, per 6 cm distalia plus minusve geniculatus. Foliorum lamina chartacea vel subcoriacea autem fragilis ambitu late ovata 52-77 cm longa 46-57 cm lata, ad basin lobis posticis grandibus semicircularibus sinu hippocrepiformi vel spathulato 15-20 cm longo ad 11 cm lato sejunctis vel raro lo-

¹ described below

² 1913, p. 28.



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bis imbricatis sinu clauso et obovato, ad apicem late obtusa ($100-140^\circ$) apice ipso acuminata (4-5 cm), in sicco fusca nervatione principali nigra, costa 0.8 cm lata, nervis lateralibus 1. utrinque 5(-6) sub angulo $35-50^\circ$ e costa oreuntibus nervis minoribus ex nervis lateralibus 1. inferioribus abeuntibus, nervis validis in uterque lobo postico ca. 5 in costulam in sinu per 5-8.5 cm nudam conjunctis. Inflorescentiae binae. Pedunculus 16-18 cm longus striis interruptis pallidis interdum elevatis prope apicem notatus. Spatha 13-18 cm longa tubo 5.5-8.5 x 2.5-4.3 cm extra atroviridi limbo extra dilute viridi. Spadix parte pistillata (fructifera) 6-7.3 x 2.5 cm, parte staminata sterili 1.5 cm longa fertili partem pistillatam subaequant. Flores pistillati ovario 3-5-loculari, ovulis in quoque loculo numerosis superpositis. Flores staminati 5-4-andri. Baccae 0.9 cm longae.

TYPUS: Julian A. Steyermark, Gerrit Davidse & A. Stoddart 122689. Climbing; leaves silvery below, rich green above; spathe pale green; peduncle terete, green. Along shore of lagunita, lower slopes (northwest side) of Cerro Negro, following quebrada to Lagunita Araguaney, southeast of Río Guasare, 2.5-3 km (by air) southeast of Rancho 505, $10^\circ 55' 30''$ N., $72^\circ 25'$ W., Dto. Mara, Edo. Zulia, 400-530 m, 28 May 1980 [Holotypus: VEN].

PARATYPUS: George S. Bunting & R.A. León 12848. Hierba trepadora. Entrenudos cortos. Catafilo volviéndose fibroso y persistente. Pecíolo terete. Dos inflorescencias por hoja. En zona de bosque húmedo ahora parcialmente talado, con mucho *Sabal* sp.; cuenca del río Guasare: alrededores del Destacamento Guasare No. 1 (La Yolanda), $10^\circ 52' 10''$ N., $72^\circ 29' 30''$ O., en laderas del cerro en la orilla izquierda del Guasare, ca. 1 km río abajo del Destacamento, Dto. Mara, Edo. Zulia, 400-500 m, 9 de diciembre, 1982 [NY, VZM].

Pertains to Section *Polyspermium* Engl.

***Philodendron anaadu* Bunt., sp. nov. (Fig. 18)**

Herba scandens. Caulis 1.7 cm diam. internodiis 2.5-4 cm longis. Petiolus 48 cm longus. Foliorum lamina tenuiter papyracea (in sicco) ambitu ovata, ad basim cordata, ad apicem acuminata (1.5 cm), ad 45-52 cm longa 32-35 cm lata nervis lateralibus 1. costalibus utrinque 7 sub angulo $50-55^\circ$ oreuntibus, lobis posticis semicircularibus marginibus paulo repandis sinu spathulato 12.5-14.5 cm longo 4.5-6 cm lato sejunctis nervis validis ca. 6-7 in costulam in sinu per 2.5-3.5 cm nudam conjunctis; abaxiale velut pulvere obducta propter punctula multissima pusilla pallida paulo elevata praesertim secus nervos principales et margines versus et in parte inferiore petioli (manifesta sine lente). Inflorescentia solitaria. Pedunculus 4 cm longus. Spatha 12 cm longa tubo ex limbo vix discreto. Spadix spatham aequans, stipitatus stipite 1-1.5 cm longo, parte pistillata 5.3 cm longa, parte staminata sterili 0.4 cm longa fertili 5.6 cm longa.

TYPUS: Francisco Delascio Ch. & Francisco Guánchez 10916. Trepadora. Espata blanca. Salto Yureba, Caño Yureba, bajo río Ventuari, $4^\circ 3'$ N., $66^\circ 1'$ O., Depto. Atabapo, Territorio Federal

Amazonas, 120-150 m, 24 octubre-4 noviembre, 1981 [Holotypus: VEN].

PARATYPUS: Julian A. Steyermark & Francisco Delascio 129149. Trepadora, alrededor de las casas. El latex del peciolo podrido calentado en el fuego se aplica para quitar los hongos de la piel. Vecindad de la comunidad de Culebra, río Cunucunuma, 3°40' N., 65°45' O., Depto. Atabapo, Territorio Federal Amazonas, 200-220 m, 22-23 y 28-29 de marzo y 1-4 de abril, 1983 [VEN].

Common name: anaadú (Yekuana, subtribe of Makiritare).

Philodendron appunii Bunt., sp. nov. (Fig. 20)

Herba scandens. Caulis usque 3.6 cm diam. internodiis florentibus 3-5 cm vel ultra longis. Cataphyllum 31 cm longum mature cadens. Petiolus subteres sed adaxiale plano-convexus prope apicem plus minusve 3-gonus, 37-44 cm longus, in medio 1.3 cm crassus apicem versus rubens, parte vaginata 4.5-8 cm longa latere altero vaginae prope apicem usque ad 2.2 cm lato. Foliorum lamina in petiolo arrecta, coriacea ambitu ovato-triangularis, usque 43-59 cm longa 18.5-25.5 cm lata, ad apicem obtusa apice ipso acuminata (2 cm), ad basim subsagittata lobulis posticis apice obtusis sinu parabolico 8.5 cm profundo sejunctis, margine externo lobuli alterius valde concavo alterius convexo, nervis lateralibus 1. utrinque 6-7 sub angulo 65-80° abeuntibus abaxiale rubenibus, nervis minoribus omnibus subparallelis. Inflorescentiae usque quinae. Pedunculus 7.5-9 cm longus. Spatha 14-15.5 cm longa tubo 7 x 2-2.3 cm extra kermesino limbo viridi sursum eburnescenti kermesino-suffuso vel -punctato, intra tubo saturate cerasino colore in basim limbi continuo sursum limbo eburneo. Spadix spatham subaequans, stipitatus stipite roseo postice 0.3 cm antice 0.8 cm longo, parte pistillata 4.2 cm longa, parte staminata sterili 1.2 cm longa fertili 6.5 cm longa. Flores pistillati ovario 6-7-loculari loculis uniovulatis. Flores staminati 4-3-andri.

TYPUS: George S. Bunting, Julian A. Steyermark & R. L. Dressler 2147. Climber. Leaf blade rather thick-leathery, adax. dark green, glaucescent and glossy if rubbed, rib slightly convex, l.'s channeled, abax. l.'s reddish. Petiole subterete but adax. flattened-convex. Spathe tube red outside, inside deep cherry-crimson with color extended onto limb briefly with some red lines reaching to midpoint of cream-colored limb. Carretera Colonia Tovar-Hacienda El Limón, several kms below the empalme with carretera Colonia Tovar-Caracas, Distrito Federal, 29 April 1967 [Holotypus: NY; isotypi: MO, US, VEN].

Pertains to Section Oligospermium Engl.

Philodendron borgesii Bunt., sp. nov. (Fig. 21)

Herba scandens. Caulis usque ad 3 m longus 4 cm diam. internodiis 3.5-5.5 cm longis. Cataphyllum crassum 21-40 cm longum viride pallidum supra medium roseo-suffusum mox fatiscens et sensim solutum. Petiolus robustus spongiosus in stirpe juvenili valde tumidus, teres usque ad 78 cm longus ad apicem 1.5 cm cras-

sus deorsum 2 cm crassus, parte vaginata 6-8.7 cm longa. Foliorum lamina subcoriacea ambitu late ovata 47-68 cm longa 38-53 cm lata, ad basim cordata lobis posticis rotundatis vel obtuse angulatis uterque lobo 14-25 cm lato sinu spathulato vel obovato 14-20 cm profundo sejunctis, ad apicem obtusa apice ipso acuminata (1.0-1.5 cm), in ambabus superficiebus nitida, adaxiale costa plana nervis lateralibus I. sulcatis utrinque 5-7 sub angulo 55-58° oreuntibus, nervis validis ex uterque costula utrinque 2-3 abeuntibus costulis in sinu per 3.2-5.4 cm nudis. Inflorescentiae ternae. Pedunculus ad 13 cm longus. Spatha 17.5 cm longa tubo 9.5 x 3.8 cm extra viridi limbo e viridi albo, intra ubique intense vinosa (saltem in tubo). Spadix usque 16 cm longus sessilis attamen axe antice per 1 cm nudo. Flores pistillati ovario 8-9-loculari, ovulis in quoque loculo 3-5 supra basim affixis. Flores staminati (e basi ad apicem spadicis) 6-4(-3)-andri. Infructescencia 9.8 x 2.5 cm. Baccae 0.4-0.5 cm longae, ad apicem truncatae, cremicolores, seminibus ellipsoideis 1.4 x 0.65 mm laevibus luteo-brunneis.

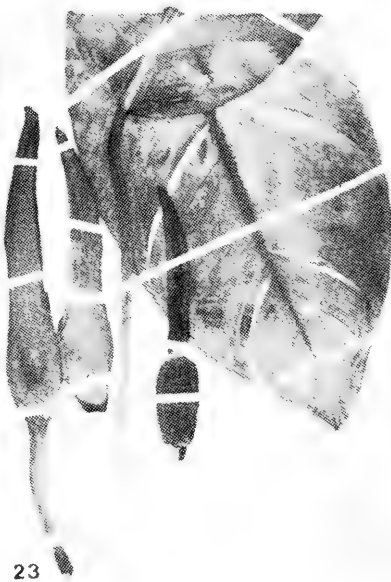
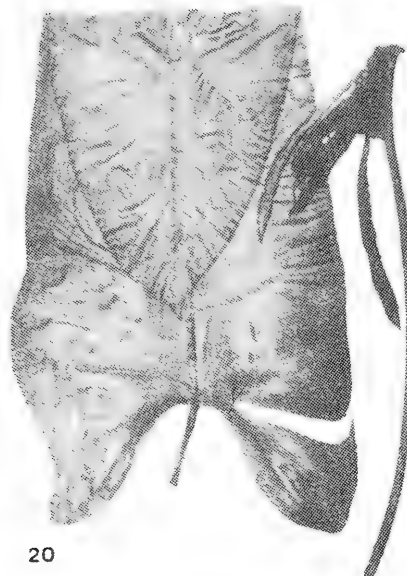
TYPUS: George S. Bunting & Gustavo Borges M. 13030. Large climber about 3 m up on tree trunk. Cataphyll early deteriorating and sloughing off little by little. Internodes scarcely longer than diameter of stem. Petiole nearly terete, stout, strongly tumid in juvenile plants. Lamina subcoriaceous, glossy on both faces, undulate. Three inflorescences together. Spathe tube medium green outside and limb greenish white in anthesis, inside spathe dark red overall (including limb). En bosque húmedo montano siempreverde; carretera San Cristóbal-Chorro del Indio-Caño Seco-La Florida, en km 25 del trayecto al este de San Cristóbal, Dto. San Cristóbal, Edo. Táchira, ca. 1100 m, 7 de junio, 1973 [Holotypus: NY; isotypi: K, MO, VEN, US].

PARATYPUS: George S. Bunting 13394. Hierba trepando 2,5 m en tronco, en bosque. Tallo x 4 cm, entrenudos hasta 4-5,5 cm de largo. Lámina foliar más o menos coriácea, lustrosa en ambas caras, nervios medio y basales en parte inferior con manchitas moradas, así como pecíolo en mitad superior. Pecíolo en ápice 1,5 cm de ancho y 1,1 cm de grosor, por encima de la parte vaginada 2,3 x 2 cm. Tres inflorescencias juntas. Espata 17,5 cm de largo, tubo 9,5 x 3,8 cm, verde afuera pero tubo mostrando sombra del color vino de su cara interna que extiende 2/3 de longitud del mismo. Infructescencia 9,8 x 2,5 cm, cremosa, frutos 5 mm de alto. En bosque siempreverde; vía San Cristóbal-Chorro del Indio-La Florida (al este de San Cristóbal), entre km 14-20 de la vía (3-9 km al este del Chorro), Dto. San Cristóbal, Edo. Táchira, ca. 1100 m, 26 de febrero, 1985 [MO, NY, VEN].

Pertains to Section Oligospermium Engl. Philodendron borgesii superficially resembles P. grandifolium (Jacq.) Schott, but there are many differences. The epithet honors Julio Gustavo Borges M., naturalist and professor, of Palmira, Edo. Táchira.

Philodendron calatheifolium Bunt., sp. nov. (Fig. 22)

Herba usque ad 3 m scandens ramis pendentibus. Caules virides argenteo-grisei transeuntes, 1.6-2.2 cm crassi internodiis in



stirpibus adultis vegetativis usque ad 7.5 cm longis in stirpibus florentibus tantum 2.5 cm longis. Cataphyllum 13-16.5 cm longum, caducum. Petiolus 24-28 cm longus manifeste alatus alis late patentibus vel stantibus persistentibus etsi marginibus siccantibus, ad 2.4 cm latus (3.4 cm latus in folio inflorescentiam subtendenti), parte non alata subterete attamen adaxiale anguste sulcata 3.5-8 cm longa; geniculum vix manifestum. Foliorum lamina aliquantum tenuis late ovata 21-39 cm longa 15-26.5 cm lata, ad basim truncata vel subcordata sinu aperto ad 1.4 cm profundo, ad apicem late obtusa et abrupte acuminata (ad 1.3 cm), in ambabus superficiebus impolita, adaxiale smaragdina costa concava 0.3 cm lata, nervis lateralibus I. costalibus utrinque 11-14 sub angulo 62-75° abeuntibus sed mox insigniter arcuatis, abaxiale costa angulari-convexa. Inflorescentiae solum in ramis pendentibus prodeuntibus, binae, usque ad 24 cm longae. Pedunculus 5-6 cm longus striis interruptis albidis leviter elevatis prope apicem notatus. Spatha 10.5-16.5 cm longa tubo 5.0-8.6 x 2.4-2.8 cm, extra ubique intense viridis intra viridis pallidior, post demum tubo luteo. Spadix spatha 0.5-1.3 cm brevior, stipitatus stipite postice 0.5 cm antice 1.7 cm longo. Baccae immaturae obovoideae ad apicem obtusae et virides deorsum albae, 0.55 x 0.35 cm.

TYPUS: George S. Bunting & Gustavo Borges M. 5002. Climber on tree trunk to 3 m with stem tips pendent and flowering. Stem to 2.2 cm diam. with internodes becoming olive-gray and shiny. Petiole wings widely spreading to somewhat ascending, inequilateral, 2.4 cm across, petiole subtending inflorescence 3.4 cm across wings, edges drying light brown. Blade held at right angle to petiole, thin but firm, matte on both faces, with 12-13 l.'s/side. Largest inflorescence 24 cm long. Peduncle with slightly elevated long whitish dashes; spathe rich green 16.5 cm long, tube approx. 8 cm long and 2.4-2.8 cm diam. En bosque original siempre-verde; carretera San Cristóbal-Chorro del Indio-Caño Seco-La Florida, entre km 20-22 (al este de San Cristóbal), Dto. San Cristóbal, Edo. Táchira, 1100-1125 m, 6 de marzo, 1977 [Holotypus: NY; isotypi: K, MO, VEN].

Pertains to Section Pteromischum Schott.

***Philodendron canaimae* Bunt., sp. nov. (Fig. 23)**

Herba terrestris. Caulis plus minusve horizontalis, elongatus attamen internodiis in parte distali brevibus, cataphyllorum reliquiis plus minusve occultis. Cataphyllum in situ siccans paulatim rumpens et solutum. Petiolus erectus laevis subteres adaxiale sulcatus marginibus canalis angulatis, 38-55 cm longus in medio 1 cm diam., multis punctis roseo-purpureis et ad apicem purpureo-brunneus notatus. Foliorum lamina in petiolo arrecta, coriacea plerumque elliptica vel elliptico-ovata 32-41 cm longa 19-21 cm lata, ad basim truncata vel late obtusa, ad apicem breviter acuminata (1.5 cm), adaxiale nitida intense viridis costa convexa ad basim 1 cm lata nervis lateralibus I. utrinque 7-9 sub angulo 50-60° oreuntibus in vivo leviter sulcatis in sicco fere invisibilibus,

abaxiale impolita costa luteola roseo-punctata nervis lateralibus I. in vivo leviter elevatis in sicco vix visibilibus, nervis minoribus plurimis subaequalibus bene notatis. Inflorescentia solitaria(?). Pedunculus pallide viridis 11 cm longus. Spatha 15 cm longa tubo 5.8 cm longo extra albo dorsaliter rubro-punctato intra sanguineo, limbo in ambabus superficiebus albo, sub fructu 23 cm longa tubo 8.5 cm longo viridenti. Spadix spatham paulo superans, stipitatus stipite 0.5-1 cm longo, parte pistillata 2.8 cm longa, parte staminata sterili 1.3 cm longa fertili 9.5 cm longa, sub fructu parte pistillata 6.3 x 3.2 cm. Baccae 0.7 x 0.3 cm. Semina ambitu elliptica vel elliptico-ovata 0.8-1 mm longa, rubro-brunnea dense albo-striata.

TYPUS: Julian A. Steyermark 106396. Terrestrial with elongate stem. Peduncle pale green. Spathe pale or olive green without, dull brown within; leaves coriaceous, ascending or erect, deep green both sides with conspicuous thickened marginal buff nerve. Vecindad del campamento "Ucaina" de Rudy Truffino, a lo largo o en la región del río Carrao, al sureste de Canaima, 6°14' N., 62°45' O., Edo. Bolívar, 450 m, 13-14 de julio, 1971 [Holotypus: VEN].

Pertains to Section Philopsammis Bunt.

Philodendron cataniapoense Bunt., sp. nov. (Fig. 24)

Herba scandens. Caulis gracilis 0.9 cm diam., brunneus pallidus valde nitidus internodiis ca. 5 cm longis. Petiolus 38 cm longus parte vaginata 3 cm longa, in stirpibus juvenilibus tumidus. Foliorum lamina papyracea (in sicco), tripartita; lobus centralis obovatus 27 cm longus 11 cm latus (in loco 15 cm supra basim costae), basim versus 3.2 cm latus (in loco 3 cm supra basim costae), apice acuminata (2-2.5 cm), adaxiale costa prope basim 0.6-0.7 cm lata nervis lateralibus I. utrinque ca. 5 sub angulo 55-60° abeuntibus marginem versus insigniter arcuatis; lobi laterales late patentes ambitu plus minusve elliptici ad 16.5 cm longi 4-5 cm lati (in stirpibus juvenilibus breviores et latiores, quam lobus anticus ultra dimidio breviores), basim versus angustati 2-2.3 cm lati, sursum attenuati autem apice obtusi, costulis angulum ca. 180° faceuntibus latere externo haud vel per 1.3 cm nudis. Inflorescentia solitaria. Pedunculus 11.5 cm longus. Spatha 10.6 cm longa tubo ca. 7 cm longo. Spadix spatha longior, sessilis, attamen basi axe antice breviter nudo. Flores pistillati ovario 5-loculari loculis uniovulatis. Flores staminata ut videtur 4-andri.

TYPUS: Julian A. Steyermark, Gerrit Davidse & Francisco Guánchez 122235. Climbing; spathe green. Flooded forest downstream from dam site, virgin rainforest along Río Cataniapo, on north side of river at dam site, 48 km southeast of Pto. Ayacucho, 5°35' N., 67°15' W., Territorio Federal Amazonas, 200-300 m, 10 May 1980 [Holotypus: VEN].

Pertains to Section Oligospermium Engl. § Doratophyllum Engl.

Philodendron consobrinum Bunt., sp. nov. (Fig. 25)

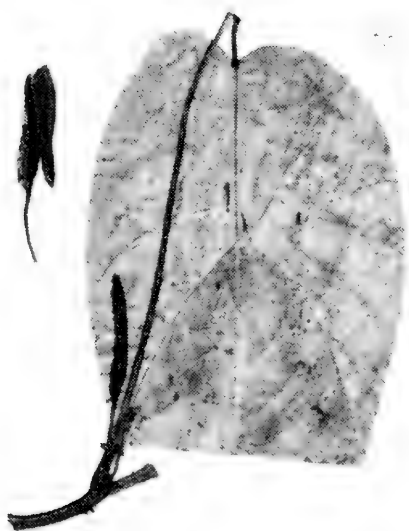
Herba scandens usque ad 8 m. Caulis 2.4-2.6 cm diam., nudus.



24



25



26



27

Cataphyllum 32 cm longum, caducum. Petiolus teres (34-)40-54 cm longus, in medio 1 cm crassus viridis prope apicem abaxiale atropurpureus, parte vaginata 3.5-6 cm longa. Foliorum lamina pergameno-semicoriacea autem fragilis ambitu ovata, 33-47 cm longa 22-32 cm lata, ad basim cordata lobis posticis semicircularibus (plerumque lobo altero quam alterum 1-2 cm longiore) sinu anguste parabolico (raro spathulato) 6.5-10 cm profundo sejunctis, ad apicem plus minusve obtusa apice ipso acuminata (1-2 cm), adaxiale costa prope basim 0.7-0.9 cm lata nervis validioribus sulcatis, nervis lateralibus 1. costalibus utrinque 4-5 sub angulo 55-65° abeuntibus, nervis principalibus in uterque lobo postico 3-4. Inflorescentiae quaternae. Pedunculus 5 cm longus. Spatha 9 cm longa tubo 4.3 x 1.8 cm extra brunneo-rubro margine cremicolori 0.3 cm lato, limbo e viridi cremicolori, intra tubo subvinosa limbo cremicolori. Spadix spatha 1.8 cm brevior, stipitatus stipite postice 0.2 cm antice 0.5-0.7 cm longo, 6.7 cm longus, parte pistillata 3.9 cm longa, parte staminata 2.8 cm longa. Flores pistillati ovario (4-)5-6-loculari loculis 1-2-ovulatis, ovulis prope basim affixis. Flores staminati 5-3-andri. Infructescentia pedunculo 6 cm longo, spatha 9.7 cm longa tubo 5.5 x 2 cm, parte pistillata spadicis 7.7 x 2.2 cm. Baccae e viridi cremicolores ad apicem truncato-concavae, 0.6 x 0.4 cm.

TYPUS: George S. Bunting 4951. Climber up tree some 8 m. Stem clean, green with silvery coating. Cataphyll pale green with yellow cast, paling on margin, white inside. Petiole terete, dark violet near apex abaxially. Blade flat, in nearly same plane as petiole, firm, brittle, rich green adax., yellow-edged, rib slightly convex x 7(-9) mm near base; larger veins sulcate. Inflorescences 4 together. Spathe tube outside maroon with a 3 mm-wide cream border; limb creamy with slight greenish cast, 1.9 cm longer than spadix; inside tube light wine color, limb cream. Maturing infructescence greenish cream. En bosque abierto; entre Villa Páez y Betania, Dtto. Junín, Edo. Táchira, 2050-2350 m, octubre, 1975 [Holotypus: NY; isotypi: K, MO, VEN].

Pertains to Section Oligospermium Engl.

Philodendron davidsei Bunt., sp. nov. (Fig. 26)

Herba scandens. Caulis elongatus 0.9 cm diam. internodiis minimum 5 cm longis, nudus. Petiolus plus minusve gracilis 33.5-37 cm longus parte vaginata 4.3-5 cm longa; geniculum ut videtur 3.2 cm longum. Foliorum lamina in petiolo arrecta, papyracea plana ambitu ovata, 43-45.5 cm longa 20.5-22.5 cm lata (in loco 11-13 cm supra insertionem petioli), ad basim subcordata lobulis rotundatis inaequalibus sinu triangulari tantum 1.0-1.5 cm profundo sejunctis, ad apicem plus minusve obtusa apice ipso anguste acuminata (1.5-2 cm), adaxiale nitida atroviridis costa bene notata nervis lateralibus 1. leviter sulcatis utrinque ca. 10 sub angulo (70°-) 75° prodeuntibus, nervis minoribus subparallelis. Inflorescentia solitaria. Pedunculus gracilis 4.8 cm longus. Spatha plus minusve gracilis 9 cm longa ubique ejusdem diametri extra(?) carminea. Spadix spatha paulo brevior, gracilis axe per basim 0.2 cm nudo, parte

pistillata 2.9 cm longa, parte staminata sterili ca. 1.5 cm longa fertili 3.5 cm longa. Flores pistillati ovario 6-loculari loculis 3-4-ovulatis, ovulis basim versus centraliter affixis. Flores staminati (e basi ad apicem spadicis) ut videtur 4-3-2-andri.

TYPUS: Gerrit Davidse, Angel C. González & R.A. León 18702. Climbing vine; leaves dark shiny green above, nerves slightly impressed, dull medium green below with main nerves elevated; spathe carmine red; fruit orange. Steep, low hills with primary semi-evergreen forest; along quebrada, 3 km E of the Río de Oro settlement on the Río de Oro, ca. 9°8' N., 72°52' W., Dtto. Colón, Edo. Zulia, 100-250 m, 27 June 1980 [Holotypus: VZM; isotypus: VEN].

Probably pertains to Section *Boursia* Reichb.

***Philodendron delascioi* Bunt., sp. nov. (Fig. 27)**

Herba scandens. Caulis gracilis 0.6-0.8 cm crassus (in sicco) internodiis 4.7-8.5 cm longis, multissimis excrescentiis spinosis tenuissimis deorsum curvatis ad 0.1 cm longis instructus. Petiolus plus minusve gracilis laevis 11-14(-22) cm longus parte vaginata tantum 1 cm longa. Foliorum lamina in petiolo arrecta, papyracea attamen plus minusve rigida (in sicco), hastata 20-23 cm longa 17.5-22 cm lata (trans lobos basales mensa), ad basim sinu apertissimo 1-2.5 cm profundo; lobus anticus triangulari-ovatus sursum longe attenuatus apice ipso acuminatus, deorsum 8-9 cm latus attingens unde in lobos laterales dilatatus, nervis lateralibus 1. costalibus utrinque 4 sub angulo 50-55° exeuntibus, multis nervis minoribus parallelis inter 1. oreuntibus; lobi laterales plus minusve triangulares ad apicem obtusi quam lobus anticus semper minores, costulis patentibus (in sinu haud nudis) nervis lateralibus validis utrinque costulae 2 in uterque lobo prodeuntibus. Inflorescentia ignota.

TYPUS: Julian A. Steyermark, Ronald Liesner & Francisco Delascio 114387. Climbing among herbs in savanna. Burns the skin. Mixed evergreen forest of low to medium-sized trees, rich in epiphytes, bordering extensive savanna; Caño Simoína, west of Isla Cocuina, south of Barra de Cocuina, 9°45' N., 61°53' W., Depto. Pedernales (boundary with Depto. Tucupita), Territorio Federal Delta Amacuro [Holotypus: VEN].

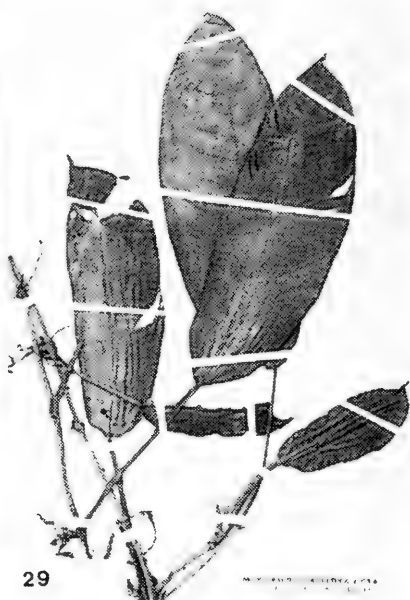
Common name: nautoto.

***Philodendron dyscarpium* Schultes var. *ventuarianum* Bunting, var. nov. (Fig. 28)**

A var. *dyscarpio* distinguitur magnitudine majore omnium partium et foliorum lamina plus minusve elliptico-ovata maxime inaequilatera marginibus lateralibus in parte centrali fere rectis vel vix convexis et nervis lateralibus latius patentibus.

TYPUS: Bassett Maguire & Celia K. Maguire 35539. Along banks of Río Ventuari, 3 hours below Las Carmelitas, Territorio Federal Amazonas, 100 m, March 10, 1953 [Holotypus: NY].

Pertains to Section *Philopsammus* Bunt.



Philodendron exile Bunt., sp. nov. (Fig. 29)

Herba exilis scandens. Caulis 0.35 cm crassus, stramineus (in sicco) internodiis 4-11 cm longis. Petiolus 4-11 cm longus fere vel prorsus usque ad basim laminae alatus; alae graciles etsi altera ad apicem ca. 0.6 cm lata altera non nisi 0.2 cm lata, erectae (initio involutae) marginibus irregulariter scariosis paulatim solutis; geniculum 0.4-0.6 cm longum. Foliorum lamina papyracea elliptica vel anguste ovato-elliptica valde inaequilatera interdum paulo falcata, margine altero fere recto altero perspicue convexo, 11-12 cm longa 3.7-7.9 cm lata (2.5-3plo longior quam latior), ad basim truncata (raro obtusa vel emarginata), sursum attenuata apice acuminata, nervis lateralibus I. debilibus utrinque 6-8 sub angulo 60-70° exeuntibus. Inflorescentia solitaria. Pedunculus 2.5 cm longus. Spatha 7.3-8.2+ cm longa (parte apicali carenti) viridis pallida tubo ca. 3.5 cm longo bene discreto. Spadix spathe paulo brevior, 7 cm longus, stipitatus stipite postice 0.6 cm antice 1.1 cm longo, parte pistillata 2.8 cm longa parte staminata 4.2 cm longa (parte sterili non distinguibili).

TYPUS: Julian A. Steyermark 107149. Climbing; leaves papyraceous, dull green. Vecindades de Simarawochi, río Matacuni, 3°49' N., 64°36' O., a 6-7 km al oeste de la frontera venezolano-brasilera, 795-830 m, 19 de abril-23 de mayo, 1973 [Holotypus: VEN].

PARATYPUS: Julian A. Steyermark 107012. Low climber; leaves papyraceous, spathe pale green. Ib. ut typus, 19 de abril-23 de mayo, 1973 [VEN].

Pertains to Section Pteromischum Schott.

Philodendron guaiquinimae Bunt., sp. nov. (Fig. 30)

Herba probabiliter terrestris. Caulis ut videtur brevis. Petiolus robustus 25 cm longus (in specimine, sed fortasse incompletus) adaxiale late canaliculatus. Foliorum lamina crasso-coriacea late ovata 32.5 cm longa 29.5 cm lata (in loco 10.5 cm supra basim costae), ad basim subcordata sinu aperto 2 cm profundo, ad apicem late obtusa apice ipso brevissime acuminata, adaxiale nitida nervis lateralibus I. sulcatis utrinque 8-9, abaxiale impolita costa et nervis lateralibus I. valde elevatis, II. et III. minus elevatis. Inflorescentia ignota.

TYPUS: Julian A. Steyermark, G.C.K. & E. Dunsterville 113297. Leaf thick, coriaceous. Plant attached to bluff on side opposite camp site. Cumbre del Cerro Guaiquinima, lomas bosqueadas entre el río Szczerbanari (río Carapo) y el pie de los peñascos de arenisca al sur del río, 5°44'4" N., 63°41'8" O., Edo. Bolívar, 750-840 m, 23 de enero, 1977 [Holotypus: VEN].

Philodendron inaequilaterum Liebm. subsp. **anthoblastum** Bunt., subsp. nov. (Fig. 31)

Differt a subspecie typica caule ex luteo brunneo, ramo speciali florifero laterali ut in Heteropsis 3.5 cm longo nodis 4 praeter cataphyllum tenue 1.8 cm longum in nodo secundato nudo, spadix axe inter parte staminata sterili et fertili nudo.

TYPUS: Gerrit Davidse, Otto Huber & S.S. Tillett 16818. Vine

creeping up tree trunk, in forest. Siquita, sandy forested eastern bank of Río Orinoco, 4°13' N., 67°47' W., Depto. Atures, Territorio Federal Amazonas, 90 m, 28 April 1979 [Holotypus: VEN].

Pertains to Section Pteromischum Schott. It is curious that this species is not represented by any other collections that I have seen from the Territorio Federal Amazonas.

Philodendron liesneri Bunt., sp. nov. (Fig. 32)

Herba scandens. Caulis usque ad 3 m longus 1 cm diam. (in sicco), laevis nitidus internodiis 4-7 cm longis in latere uno valde applanatis. Cataphyllum tenue 16.5 cm longum. Petiolus aliquantum spongiosus subteres sed adaxiale late canaliculatus marginibus canalis angularibus, 20-24 cm longus 0.9 cm crassus (in medio). Foliorum lamina in petiolo arrecta, chartacea (in sicco membranacea) oblongo-elliptica vel ovata 32 cm longa 12.3-14.5 cm lata, ad basim truncata vel parum emarginata (in vivo) valde obliqua (in sicco), ad apicem plus minusve obtusa apice ipso acuminata, in ambabus superficiebus nitida, adaxiale laete viridis costa deorsum plana 0.6 cm lata sursum elevata nervis lateralibus I. sulcatis utrinque 7-8 sub angulo 70-75° exeuntibus. Inflorescentiae (in specimine novellae) binae. Pedunculus 2 cm longus. Spatha 9.5 cm longa tubo praeter colorem nondum distinguibili, in parte inferiore vinacea superiore viridis. Flores pistillati ovario 7-8-loculari, loculis probabiliter uniovulatis (ovula non visa).

TYPUS: Julian A. Steyermark & George S. Bunting 102673. Climber 3 m on tree trunk. Stem flat-convex on one side between each node; petiole somewhat spongy, more or less terete but adax. wide concave-channeled, x 9 mm at midpt.; lf. blade thin but firm, in same plane with petiole, glossy on both surfaces, adax. bright green with flat midrib; inflorescences paired (quite young). Spathe 9.5 cm long, wine on tube, green on limb. A lo largo del río Casiquiare, entre Pueblo Viejo y San Carlos de Río Negro, 1°57' N., 66°50' O., en San Sebastián, solamente 15 minutos arriba de la desembocadura del río, Territorio Federal Amazonas, 125 m, 16 de abril, 1970 [Holotypus: VEN].

Probably pertains to Section Oligospermium Engl.

Philodendron marahuacae Bunt., sp. nov. (Fig. 33)

Herba parva. Caulis 30 cm longus usque ad 1.3 cm diam. nudus internodiis 0.8-1.3 cm longis, foliis prope apicem congestis. Cataphyllum 11.5 cm longum plus minusve caducum (licet cataphyllum reliquiis tenuibus paulo fibrosis ad caulem adhaerentibus). Petiolus 23-29 cm longus. Foliorum lamina chartacea ambitu ovata 20-23 cm longa 8-9.3 cm lata (in loco 4.3-5 cm supra insertionem petioli), ad basim cordata lobis posticis sinu triangulari 1.0-2.1 cm profundo sejunctis, nervis lateralibus I. utrinque ca. 4 superioribus sub angulo 30-40° exeuntibus inferioribus latius extensis, nervis II. et minoribus todis subparallelis. Inflorescentia ignota.



TYPUS: Julian A. Steyermark 129688. Terrestrial in mossy recumbent forest; bosque enano musgoso con ramas semidecumbentes y entrecruzadas, Macizo de Marahuaka, laderas que miran al suroeste, cabeceras del río Iguapo, sector meridional de la Meseta Sureste, 3°36' N., 65°23'10" O., Territorio Federal Amazonas, 1560 m, 13-14 de octubre, 1983 [Holotypus: VEN].

There is some question if the type specimen is adult, although its overall size suggests that it may be. The lack of visible peduncle scars on the stem lends no credence to the argument.

Philodendron multinervum Bunt., sp. nov. (Fig. 34)

Herba scandens. Caulis . . . Petiolus 39 cm longus parte vaginata 6 cm longa. Foliorum lamina papyracea (in sicco membranacea) ambitu plus minusve triangularis modice inaequilatera, prope medium margine latere angustiore convexo latere altero concavo, 37.5 cm longa 17.5 cm lata (insertione petioli opposita), ad basim plus minusve sagittato-cordata lobis posticis rotundatis sinu late parabolico 5.5 cm longo sejunctis, lobo altero 7 cm longo quam alterum 2.5 cm longiore, adaxiale obscure viridis costa prope basim 0.8 cm lata (in sicco), nervis lateralibus principalibus costalibus utrinque ca. 12 vel ultra sub angulo 70-80°, nervis validis in lobis posticis plerumque 3 in costulas breves in sinu per 1.5-2 cm nudas conjunctis. Inflorescentia solitaria. Pedunculus 7 cm longus. Spatha 10.3 cm longa extra pallide viridis, tubo 5.5 cm longo intra ex brunneo rubro limbo albido. Spadix spatham aequans antice axe ad basim per 0.5 cm nudo, parte pistillata 8 cm longa, parte staminata sterili 0.7 cm longa fertili 4.2 cm longa (in sicco). Flores pistillati ovario 5-7-loculari loculis 2-ovulatis. Flores staminati plerumque 3-2-andri.

TYPUS: Julian A. Steyermark 107164. Climbing; spathe pale green without, whitish within above middle, maroon within below middle, staminate and pistillate spadix white, equaling spathe; leaves papyraceous, deep green above, dull green below. Vecindades de Simarawochi, río Matacuni, 3°49' N., 64°36' O., a unos 6-7 km al oeste de la frontera venezolano-brasilera, Territorio Federal Amazonas, 795-830 m, 18 de abril-23 de mayo, 1973 [Holotypus: VEN].

Pertains to Section Oligospermium Engl. It differs from P. acutatum Schott by the narrower leaf blade having more numerous principal lateral veins as well as poorly developed basal lobes that lack well-defined basal ribs, and by the apparently solitary inflorescence.

Philodendron orionis Bunt., sp. nov. (Fig. 36, 37)

Herba grandis scandens. Caulis usque 10 m longus 6 cm diam. nudus internodiis ca. 1.5 cm longis. Cataphyllum usque 58 cm longum mox caducum. Petiolus usque 1.04 m longus, in medio fere teres 1.9-2.5 cm diam., apicem versus adaxiale convexus vel planus, interdum paulo purpureo-maculatus, parte vaginata 5.7-10 cm longa. Foliorum lamina tenuiter semicoriacea (in sicco chartacea) tamen fragilis parallela ad nervos laterales l. facile fracta, ovata



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(in stirpe juvenili triangularis), 73-90 cm longa 47-58 cm lata (in loco 6-12 cm supra basim costae), ad apicem acuta vel obtusa apice ipso acuminata (0.8-2 cm), ad basim cordato-sagittata lobis posticis 19-23 cm longis 20-25 cm latis plerumque angularibus apice obtusis sinu ob margines fere contiguos anguste spathulato sejunctis vel lobis imbricatis sinu clauso et obovato, adaxiale obscure viridis plus minusve nitida costa 1.7 cm lata nervis lateralibus I. costalibus sulcatis utrinque 5-6 sub angulo 55-70° prodeuntibus, uterque costula in sinu per 0.7-2 cm nuda nervis principalibus latere interiore 3 latere exteriori 3-4. Inflorescentiae binae vel ternae. Pedunculus 3.5-6 cm longus viridis sursum purpurescens. Spatha 18-19 cm longa tubo 9-9.5 cm longo 3-4.3 cm crasso extra saltem latere uno obscure vinaceo margine diaphano 0.3 cm lato limbo viridi vinaceo-maculato, intra tubo obscure rubro-pureo limbo albido. Spadix spatha 1.3 cm brevior, 13.3-16 cm longus, postice sessilis antice axe in basi per 0.8-2.7 cm nudo, parte pistillata luteola antice 4.9 cm postice 2.8 cm longa 1.7 cm crassa demum 6.5(4.6) cm longa, parte staminata sterili alba 2.6-3 cm longa 2.2 cm crassa fertili alba 7.8 cm longa 2.2 cm crassa. Flores pistillati ovario 7-9-loculari, ovulis in quoque loculo numerosis superpositis. Flores staminati 6-5(-4)-andri.

TYPUS: George S. Bunting & Miguel Fucci 13470. Epífita trepando hasta 10 m en tronco, el metro apical colgante. Tallo x 6 cm, limpio. Pecíolo hasta 1 m de largo, casi terete en mitad, hacia ápice adax. convexo. Lámina delgadamente semicoriácea, sin embargo frágil, adax. verde oscuro y más o menos lustrosa, nervio medio algo convexo x 1,7 cm en base, I. sulcados, los menores finos y elevados. Inflorescencias 3 juntas, casi en anthesis 21,5 cm de largo; espata 18 cm de largo; tubo 9 x 3,3 cm, afuera vino tinto oscuro y verde en limbo, adentro tubo morado esp. fuerte en mitad inferior y limbo blanquecino; espádice 15 cm de largo, sésil atrás. En bosque nublado; Páramo Agua Linda, en la vecindad de las torres de relé de TV en la cima del cerro directamente al norte de Palmarito (en la carretera Lara-Zulia ca. 35 km al este de El Venado, Edo. Zulia), en km 12-13 de la vía, 10°8' N., 70°43' O., Dtto. Torres, Edo. Lara, ca. 1300 m, 14 de marzo, 1985 [Holotypus: NY; isotypi: K, MO, VEN].

PARATYPUS: George S. Bunting & Alexander Stoddart 9727. Hierba inmensa trepando en tronco de árbol ca. 4 m y extendiéndose sobre el piso. Pecíolo subterete, adax. más o menos aplanado, x 2,2 cm en mitad. Lámina bien firme, lustrosa adax., nervio medio plano en la haz, bajo-angular en envés. Inflorescencias un par, 25 cm de largo; espata 19 cm de largo, tubo morado en un lado y 9,5 x 4,3 cm. Ib. ut typus, 6-7 de septiembre, 1980 [K, NY, VEN].

Pertains to Section Polyspermium Engl. The paratype was collected at Fundo Orión, retreat of Dr. N. E. Durango Nazariego, physician and naturalist, of Maracaibo, Edo. Zulia.

Philodendron peraiense Bunt., sp. nov. (Fig. 35)

Herba subscandens. Caulis . . . Petiolus 44-55 cm longus, quam lamina 1.14-1.45plo longior; geniculum ut videtur longum. Fo-

liorum lamina papyracea (in sicco) elliptica vel elliptico-ovata, 36.5-38 cm longa 16.5-22 cm lata, ad basim obtuso-subtruncata, ad apicem obtusa apice ipso acuminata (1 cm), nervatione in ambabus superficiebus prominenti, costa lata nervis lateralibus 1. utrinque 9-10 sub angulo 65-75° oreuntibus. Inflorescentia ignota.

TYPUS: Julian A. Steyermark 111356. Subclimbing. Virgin tall forest; 9 km east of Perai-tepuy, Edo. Bolívar, 900 m, January 3, 1975 [Holotypus: VEN].

PARATYPUS: Julian A. Steyermark 111357. Subclimbing. Virgin tall forest; *ib. ut typus*, January 3, 1975 [VEN].

Probably pertains to Section *Philopsammis* Bunt.

Philodendron perplexum Bunt., sp. nov. (Fig. 38)

P. lindenii Schott affine sed differt foliorum lamina ambitu fere triangulari et lobis posticis brevioribus sinu minus profundo sejunctis.

TYPUS: George S. Bunting 4402. Climber to 8 m up tree trunk. Stem x 2.4 cm, internodes 8.5 cm long, surface silvery-gray. Petiole spongy, not strong, subterete, light green with bright green dashes. Leaf blade firm and pliable, undulate, adax. rich green & glaucescent, glossy if rubbed, midrib convex 8 mm wide, not really nude in sinus, abax. pale green & very glossy with rib lime green & strongly convex, l.'s. salient. Cataphyll 23.5 cm long, creamy with green spots. Peduncle stoutish, medium green. Spathe 16 cm long (pre-anthesis); tube 7.5 x 1.9 cm, subfusiform, outside medium green with a few purplish circular spots, limb cream, inside tube cherry in basal half and creamy upward with orangish lines extending onto the creamy limb. En bosque siempreverde; alrededores de La Fría, en Las Pavas (desvío hacia La Grita), a lo largo del caño Aguas Calientes, Edo. Táchira, 125-200 m, 9 de abril, 1971 [Holotypus: NY; isotypi: K, VEN].

PARATYPUS: George S. Bunting 13386. Hierba trepando 5 m en tronco. Tallo x 2 cm. Pecíolo algo aplanado adax., en ápice x 0,8 cm, encima de la parte vaginada x 1,8 cm, vaginado 10 cm. Lámina foliar más o menos tenue, adax. semilustrosa, algo glaucescente, nervio medio algo convexo, l. sulcados, abax. muy lustrosa. Pedunculo 5,5 cm de largo. Espata 13,3 cm de largo, tubo 6 x 1,5 cm (joven), toda verde excepto tubo adentro rojo cerezo en mitad basal; 1,2 cm más larga que espádice. Espádice sésil, parte pistilada 3,4 cm de largo. En bosque siempreverde; *ib. ut typus*, 25 de febrero, 1985 [NY, VEN].

Pertains to Section *Oligospermium* Engl.

Philodendron rhodoaxis Bunt. var. ***angustifolium*** Bunt., var. nov. (Fig. 39)

Differt a var. *rhodoaxe* foliis minoribus lamina proportione angustiora pro medio 3.5plo longiora quam latiora (in illa 2.4plo).

TYPUS: Julian A. Steyermark, Victor Carreño & Elisabeth Diederichs 106738. Climbing; spathe green; leaves coriaceous, shining

dark green above. Selva nublada virgen en la fila de la cumbre, El Amparo hacia Candelaria, a 7-10 km al norte de Salóm, Edo. Yara-cuy, 1200-1300 m, 27-30 de diciembre, 1972 [Holotypus: VEN].

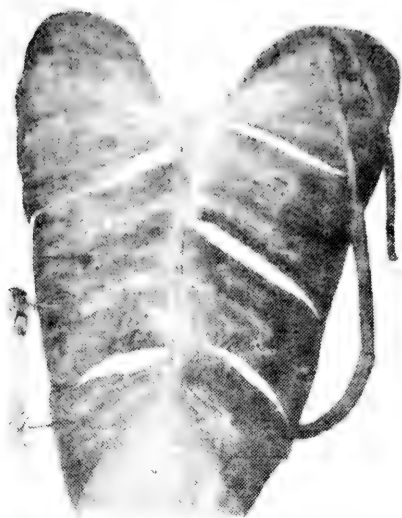
PARATYPUS: Julian A. Steyermark, George S. Bunting & G. Wessels-Boer 100237. Climbing; sheath closed; leaves coriaceous, shiny both sides, dark green above, medium green below. Cerro La Chapa, selva nublada al norte de Nirgua, Edo. Yaracuy, 1200-1400 m, 9-10 de noviembre, 1967 [VEN].

Pertains to Section Pteromischum Schott.

Philodendron sabulosum Bunt., sp. nov. (Fig. 40)

Herba usque 1.5 m alta. Caulis erectus vel interdum basi truncorum arborum breviter adhaerens, usque 40 cm longus 2.7-3 cm crassus internodiis brevibus, ubique cataphyllorum reliquiis persistentibus tectus. Cataphyllum cremicolor interdum vinoso-maculatum vel roseo-vinoso-suffusum, in situ siccans persistens paulatim solutum (haud fibrosum). Petiolus arrectus rigidus, subteres attamen adaxiale canaliculatus canali quam petioli dimidio angustiore marginibus prominentibus, 25-45(-62) cm longus parte vaginata 4.5-10 cm longa; geniculum 1.4-1.7 cm longum. Foliorum lamina petiolum aequans vel eo 1.5 plo longior, dure coriacea rigida ambitu elliptica, 35-56 cm longa (8-)12.5-25.5 cm lata, ad basim late cuneata vel truncata vel leviter emarginata, ad apice obtusa interdum cuspidata (0.4 cm), modice corrugata, adaxiale saturate viridis glaucescens et seminitida, costa pallidiore 1.1-1.6 cm lata nervis lateralibus I. sulcatis utrinque 7-9 sub angulo 50-65° (-70°) prodeuntibus, abaxiale impolita costa valde convexa nervis lateralibus I. non validis. Inflorescentiae solitariae. Pedunculus (sub fructu) 7.5-17 cm. Spatha 11-17 cm longa tubo 4.5-7 cm longo extra olivaceo pallido limbo albo, intra tubo nitido vinoso limbo roseo vinoso-punctato ad apicem cremicolori. Spadix spatham aequans vel ea brevior, stipitatus stipite cremicolori postice 0.3-0.7 cm longo antice 1 cm longo, parte pistillata 2.3-3.5 x 1.5 cm, parte staminata sterili 1-2.5 x 1.3 cm fertili 6 x 1.2 cm. Flores pistillati ovario 2(-3)-loculari, loculis 7-9-ovulatis ovulis superpositis. Flores staminati (5-)4(-3)-andri. Infructescentia ipsa 5.5-6.4 cm x ca. 3 cm. Baccae ambitu oblongae (compressio-cylindricae) 0.6-0.7 cm x 0.3-0.34 cm apice ex viridi cremicolores deorsum cremicolores. Semina 1.25 x 0.64 cm brunnea.

TYPUS: George S. Bunting, L.M.A. Akkermans & J. van Rooden 3848A. Erect herb or stems shortly clinging to tree base, not more than 40 cm long, with persistent cataphyll remains dark brown. Petiole stiff, green, subterete adax. canaliculate. Leaf blade coriaceous, very smooth adax., rich green, glaucescent, semi-glossy, very glossy when young; midrib paler 1.1-1.6 cm wide, downward flat upward sl. convex; adax. lime green, matte, midrib strong convex; new leaves coppery adax. with rosy coppery rib, abax. pale green suffused rosy with midrib very pale green. Ped. pale green. Spathe tube outside pale olive, limb white, inside tube glossy wine-colored with limb rose dotted with wine and



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creamy near apex. Stipe cream, 1.0(0.7) cm long; spadix slender. Infructescence proper 5.5 x 2.9 cm, fruits greenish cream apically, creamy below, 7 x 3 mm, oblong (compressed-cylindric). En sabana y márgenes del bosque; alrededores de Yavita (río Temi), Depto. Casiquiare, Territorio Federal Amazonas, 125-140 m, 11-13 de julio, 1969 [Holotypus: NY; isotypi: U, VEN].

PARATYPUS: Bassett Maguire, John J. Wurdack & George S. Bunting 36335B. Caulescent herb to 1.3 m high. Lower stem bare in tall plants. Spathe white without; within white above, female portion dark red. Spadix white. Petiole canaliculate. Locally abundant in sabanita, Yavita-Pimichín trail, near Pimichín, Río Guainía, Territorio Federal Amazonas, 140 m, 22 November, 1953 [NY, VEN].

Petains to Section Philopsammis Bunt.

Philodendron strictum Bunt., sp. nov. (Fig. 41)

Herba erecta. Caulis elongatus per 0.6-1.0 m distale erectus parte proximali reclinatus, fortis et fibrosissimus 4.5-8 cm diam. internodiis 2-3.5(-6) cm longis, deorsum nudus parte superiore cataphyllorum reliquiis persistentibus. Cataphyllum usque 52 cm longus in situ siccans paulatim fractans et solutum. Petioli arrecti perrigidi, in medio subteretes adaxiale modice plani, sursum semiteretes, usque 0.96-1.25 m longi 1.9 cm crassi (in medio), quam laminae 1.5-1.7plo longiores, parte vaginata ca. 6 cm longa, per 15-20 cm superiora subgeniculati, in sicco epidermide plus minusve fulvo-pellucida et soluta. Foliorum lamina in petiolo reflexa chartacea secus nervos laterales facile fracta, ambitu late ovata 51-79 cm longa 37-65 cm lata, ad apicem obtusa apice ipso acuminata (1.5-3 cm), ad basim cordata lobis posticis late rotundatis sinu anguste spathulato 14-24 cm longo sejunctis vel lobis imbricatis sinu clauso et obovato, adaxiale nitida vel glaucescens costa plana ad 1.3 cm lata nervis lateralibus 1. costalibus sulcatis utrinque 7-9 sub angulo 50-55°, nervis validis in uterque lobo postico 6-7 in costulam 4(-6) cm longam in sinu per 2-4.5 cm nudam conjunctis, abaxiale impolita glauca costa et nervatione principali convexa luteo-viridi, nervis minoribus in ambabus superficiebus porominentibus. Inflorescentiae una multae. Pedunculus 9 cm longus. Spatha anguste cylindrica usque 16 cm longa tubo 6.5 cm longo, extra tubo(?) sordide roseo-rubro limbo(?) pallide viridi. Spadix spatha ca. 1 cm brevior, sessilis, parte pistillata 2 cm longa, parte staminata sterili ca. 2 cm longa fertili 9 cm longa. Flores pistillati ovario ut videtur 7-8-loculari, ovulis in quoque loculo numerosis superpositis. Flores staminati 4-3-andri.

TYPUS: George S. Bunting & Gustavo Borges M. 5001. Huge herb on ground with terminal meter of stem more or less erect. Stem 7-8 cm diam. Cataphyll greenish cream dashed pink, drying in place to thin fibrous mass, its paper-thin epidermal layer sloughing off or adherent to stem for a period. Petioles firm, ascending (nearly vertical), at midpt. 1.6 cm thick, subterete but adaxially low angular-convex, upper 20 cm geniculate! Blade at 90° or more to

petiole, thin, firm but fragile (tears along nerves easily), rich green adax. & glaucescent, glossy if rubbed; rib flat 1.3 cm wide, upward lightly channeled, basal ribs sulcate & nude 2.5-4.5 cm; abax. lime green, matte, rib yellow-green low angular-convex. Inflorescences just forming, very young. En bosque siempreverde original; carretera San Cristóbal-Chorro del Indio-Caño Seco-La Florida, entre km 20-22 (al este de San Cristóbal), Edo. Táchira, 1100-1125 m, 6 de marzo, 1977 [Holotypus: NY; isotypus: VEN].

PARATYPUS: Julian A. Steyermark & Ronald Liesner 119063. Terrestrial; erect stems up to 3 m high; leaves glaucous or gray-silvery green below, rich green above, very large; spathe dull rose-red and pale green without, narrowly cylindrical, several clustered at base of stem. Primary forest over sandstone substrate, Cerro Las Minas, bordering Quebrada Las Minas, 19-20 km SE of Santa Ana, 7°36' N., 72°13' W., Edo. Táchira, 1150-1250 m, 29 July 1979 [VEN].

Pertains to Section Polyspermium Engl.

Philodendron sucrense Bunt., sp. nov. (Fig. 42)

Herba grandis. Caulis dependens 1 m vel ultra longus 8 cm diam. internodiis brevissimis, strato crasso reliquiarum cataphyllorum vestitus. Cataphyllum latum 32 cm longum deorsum usque ad 2.5 cm crassum. Petiolus robustissimus gravisque leviter spongiosus, subteres attamen adaxiale perspicue planus, 69-95 cm longus 2.7 cm latus (2.3 cm crassus) supra medium violaceo-notatus, parte vaginata ca. 5 cm longa. Foliorum lamina in petiolo arrecta, coriacea etsi secus nervos laterales facile fracta, ambitu late ovata usque ad 75 cm longa 63 cm lata, ad basim subsagittato-cordata, ad apicem late obtusa (170-180°) et abrupte acuminata, valde undulata, lobis posticis subangularibus apice ipso obtusissimis sinu aperto 10-15 cm profundo sejunctis, adaxiale vix nitida leviter glaucescens costa basi ca. 1.3 cm lata, nervis lateralibus I. costalibus utrinque ca. 7-8 late sulcatis sub angulo 45-55° oreuntibus, costa et nervis rubro-purpureo-punctatis, I. basalibus 3-5 in costulas breves in sinu 4-6.5 cm nudas conjunctis, abaxiale lamina viridis pallidissima, costa valde angulari-convexa purpureo-maculata, lateralibus I. validissimis convexis ex viridi cremicoloribus. Inflorescentia ignota.

TYPUS: George S. Bunting 2703. Huge epiphyte just below crown of large, moriche-like palm. Stem 1 m or more long, pendent from lower fronds of palm, 8 cm thick (x.s.) but appearing larger by persistence of old cataphylls that deteriorate in place, completely clothing stem and making it look huge (perhaps 10 cm diam.). Cataphyll pale greenish white with bright green dashes overall, early becoming dark rust-cacao color, somewhat red-spotted, decidedly wide, 2-ridged abax., tissue 1.7-2.5 cm thick! Cut tissue with pungent, agreeable odor. Petiole heavy, slightly spongy, rounded below & very flat adax. with decided angles at margins of flat face, with many elongate violet spots esp. in upper $\frac{1}{2}$ or $\frac{1}{3}$ and bright green striolate-dashed. Blade suberect on petiole, decidedly coriaceous, quite pliable though tears easily along

veins; midrib adax. slightly concave, 1.3 cm wide near base, with fine red-purple dots over all the ribs & veins; basal ribs ascending from plane of anterior lobe; blade scarcely glossy adax. sl. glaucescent, abax. not glossy, very pale green with even paler midrib & I.'s. Not flowering. En bosque al lado del caño, carretera Caripito-Carúpano, 42 km al noroeste de Caripito, entre Río Grande y Juan Antonio, Edo. Sucre, ca. 225 m, 1 de diciembre, 1967 [Holotypus: NY; isotypi: K, VEN].

Philodendron tachirens Bunt., sp. nov. (Fig. 43)

Herba scandens. Caulis usque ad 4 m longus 2.4 cm diam. internodiis (2-)3-5 cm longis, nudus. Cataphyllum 16-17.5 cm longum, caducum. Petiolus crassus (in stirpe juvenile valde tumidus) subteres attamen prope apicem adaxiale planiusculus, 22-31 cm longus 1.7 cm latus (in medio) parte vaginata 2.2-5.8 cm longa. Foliorum lamina plana subcoriacea (vel in sicco crassiuscule papyracea) inaequilatera late ovata 30-35 cm longa 22-29 cm lata, ad basim oblique cordata vel subcordata lobis posticis rotundatis brevis sinu triangulari 2-5 cm longo sejunctis, ad apicem late obtusa (125-130°) apice ipso abrupte acuminata (0.4-1 cm), adaxiale saturate viridis glaucescens vel nitescens costa prope basim fere plana et 1.4 cm lata sursum convexa nervis lateralibus I. sulcatis utrinque 7 sub angulo 70-75° abeuntibus, abaxiale costa lata convexa nervis lateralibus I. convexis. Inflorescentiae quaternae vel quinae. Pedunculus 6-10 cm longus. Spatha sine constrictione ubique ejusdem diametri 7-7.5 cm longa 0.7-0.8 cm diam., dimidio inferiore extra viridis intra cerasina, dimidio superiore in ambabus paginis alba, demum usque ad 9.2 cm longa deorsum 1.1 cm sursum 0.9 cm diam. Spadix spatha paulo brevior, stipitatus stipite postice 0.1-0.3 cm antice 0.3-0.6 cm longo, parte pistillata 2.1-3 x 0.65 cm, parte staminata sterili 0.5-0.6 x 0.45 cm fertili 3.3 x 0.55 cm. Flores pistillati ovario 5-loculari loculis uniovulatis. Flores staminata constanter 3-andri.

TYPUS: George S. Bunting, Luis E. Chacón & Gustavo Borges M. 8587. Trepando 3 m en tronco de un árbol. Tallo limpio, 2.0-2.4 cm diám. (en un mismo tallo). Pecíolo terete, cerca del ápice poco aplanada adax., 1.7 cm diám. (en mitad). Lámina carnosa, bien dura, en haz verde intensa, lustrosa si frotada; nervio medio poco convexo hacia arriba, en base casi plano 1.3 cm de ancho; nervios I. sulcados. Espata sin constricción, 7-8 mm diám., tubo fuera verde, adentro color cereza, limbo blanco en ambas caras. En bosque montañoso húmedo original; carretera San Cristóbal-Chorro del Indio-Caño Seco-La Florida, entre km 19-23 al este de San Cristóbal, o sea 8-12 km al este del Chorro del Indio, Dtto. San Cristóbal, Edo. Táchira, 1100-1150 m, 23 de diciembre, 1979 [Holotypus: NY; isotypi: MO, VEN].

PARATYPUS: George S. Bunting & Gustavo Borges M. 13031. Climbing up tree trunk ca. 3 m. Petiole more or less tumid even in adult spec., extremely so in juv. shoots, more or less terete. Blade not reflexed though at angle to pet. Lamina subcoriaceous, midrib stout and convex, I. laterals sulcate. Inflorescences 1-3



together, very small, same diameter throughout, tube green outside, limb creamy on both sides, tube inside cherry red. En bosque húmedo montano siempreverde; carretera San Cristóbal-Chorro del Indio-Caño Seco-La Florida, en km 25 al este de San Cristóbal, Edo. Táchira, ca. 1100 m, 7 de junio, 1973 [MO, NY, VEN].

Pertains to Section Oligospermium Engl.

Philodendron tatei Krause subsp. **melanochlorum** (Bunt.) Bunt., comb. nov. (Fig. 44)

P. melanochlorum Bunt., Acta Bot. Venezuelica 10(1-4): 304. 1975.

TYPUS: George S. Bunting 2858 [Holotypus: MY]. PARATYPUS: Julian A. Steyermark s.n. (Núm. Herb. 86718) [VEN].

Pertains to Section Philopsammis Bunt. The close affinity of P. melanochlorum and P. tatei is demonstrated by recent collections of these taxa. It now seems appropriate to treat them as parts of a single species.

Philodendron triangulare Bunt., sp. nov. (Fig. 45)

Herba scandens. Caulis usque ad 4 m longus irregulariter 4-gonus latere angustissimo sulcatus internodiis 10 cm longis 1.7 cm diam. Cataphyllum 29.5 cm longum mox caducum. Petiolus succosus fragilis subteres attamen adaxiale planus, 35-45 cm longus 1.3 cm latus (in medio) parte vaginata 7-10 cm longa. Foliorum lamina in petiolo arrecta, plus minusve coriacea tamen fragilis (in sicco semicoriacea) ambitu triangularis marginibus lateralibus plus minusve rectis, 34-43 cm longa 17-23 cm lata (in loco 4-6 cm supra insertionem petioli), ad basim plus minusve subcordata sinu aperto 1.5-3.5 cm profundo, apice anguste acuminata (2-3 cm), in ambabus paginis nitida, adaxiale saturate viridis costa convexa 0.6 cm lata nervis lateralibus tenuibus sulcatis utrinque 6-7 sub angulo 55-65° (-70°) oreuntibus, abaxiale nervis omnibus prominentibus. Inflorescentiae senae. Pedunculus usque ad 10 cm longus (per anthesin). Spatha 8.5-14.5 cm longa (cuspidē 0.3 cm longo incluso) tubo vix discreto extra laete viridi limbo pallidiore, intra ubique ex cremeo viridis. Spadix stipitatus stipite 0.5-0.7 cm longo, parte pistillata 4-4.3 cm longa, parte staminata 7.8 cm longa. Flores pistillati ovario 5-7-loculari loculis uniovulatis. Flores staminati (5-)4-2-andri.

TYPUS: George S. Bunting 4372. Climber 4 m on tree trunk. Stem irregularly 4-angular & furrowed on one side, x 1.7 cm. Petiole succulent, brittle, subterete with adax. face flattened. Blade not reflexed, more or less coriaceous but very brittle, margins strongly undulate, glossy on both surfaces. Inflorescences 6 together. Spathe tube glossy bright green outside, limb paler, inside creamy green overall. Cataphyll caducous, 29.5 cm long. En selva nublada al lado de una quebrada; carretera Escuque-La Mesa de San Pedro, aprox. 5 km arriba de Escuque, Edo. Trujillo, 1300-1650 m, 6 de abril, 1971 [Holotypus: NY; isotypi: K, VEN].

Pertains to Section Oligospermium Engl.

***Philodendron victoriae* Bunt., sp. nov. (Fig. 46)**

P. barrosoano Bunt. maxime affine sed plerumque planta major, foliorum lamina lobo antico proportione angustiore sed deorsum minus contracto marginibus magis sinuato-repandis, lobis laterali-bus apicem versus obtusioribus apice ipso non attenuatis autem obtuso-rotundatis sinu proportione profundiore sejunctis, spatha quam spadice saepe brevior et sine acumine apicali.

TYPUS: George S. Bunting 13377. Hierba trepando en tronco de árbol. Lámina foliar adax. lustrosa si frotada, en envés lustrosa, márgenes moradas. Pecíolo con pocas manchitas moradas en parte superior, subterete, algo aplanado adax., x 2 cm de ancho, 1,8 cm de grueso (en mitad). Espata tan larga como espádice, 16,2 cm de largo, tubo 9 x 5,7 cm; afuera tubo verdoso, limbo blanco, toda marcada con manchas rojas; tubo adentro rojo-cerezo. En bosque siempreverde; alrededores de La Fría, en Las Pavas (desvío hacia La Grita), a lo largo del caño Aguas Calientes, Edo. Táchira, 125-200 m, 25 de febrero, 1985 [Holotypus: NY; isotypus: VEN].

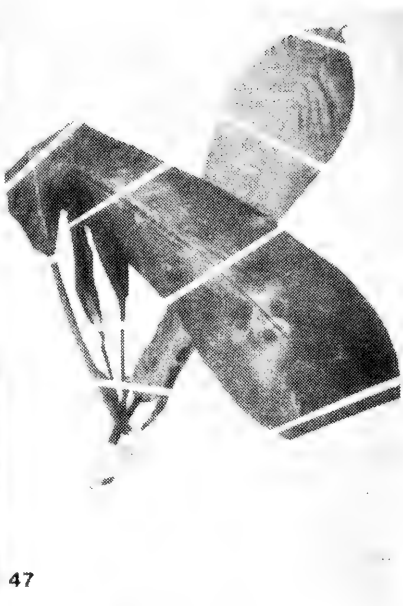
PARATYPI: George S. Bunting 2269. High-climbing on tree trunk. Stem to 3.5 cm thick. Cataphyll 32 cm long, spongy. Blade subcoriaceous. Petiole to 83 cm long, effectively terete, x 1.6 cm, vaginate to 3.5 cm, succose & tissue sort of gelatinous. Peduncles 5 together, 6 cm long in anthesis. Spathe 14.5 cm long; tube 7.5 cm long, outside greenish flushed rose with many dark purple dots on back, limb outside cream-yellow flushed rose & boat-shaped, inside tube cherry-rose in base fading upward to constriction, above creamy white on limb. Spadix 14 cm long, 1-2 mm longer than spathe, sessile but nude 7 mm in front. Common; seen at somewhat lower elevations but none at higher ones; Barinitas, en bosque inmediatamente al lado del límite suroeste del pueblo, Edo. Barinas, ca. 500 m, 21 de agosto, 1967 [K, NY, VEN].

George S. Bunting 2371. Large climber. Stem 4.2 cm thick. Leaf blade glossy adax., scarcely reflexed on petiole, the 3 lobes in same plane; basal ribs forming 180°. Petiole terete, purplish at apex. Inflorescences 3 together. Peduncle 5 cm long, greenish. Spathe 15.3 cm long, 4 mm shorter than spadix; tube 8.4 cm long, outside greenish with round wine-colored dots, inside cherry-colored up to constriction; limb cream-colored outside, creamy white & glossy inside; in age, spathe to 20 cm long, tube 10.5 cm long, green overall outside. Agua Dulce, sitio 9 km al este de la alcabala de El Corozo, carretera San Cristóbal-Santo Domingo del Táchira, Edo. Táchira, 1 de octubre, 1967 [NY, VEN].

Pertains to Section *Oligospermium* Engl. Very related to *P. barrosoanum* Bunt. of Amazonia, *P. victoriae* is isolated north of the Llanos at the base of the Cordilleras of Mérida and Perijá. The epithet refers to the fancied resemblance of the leaf blade of this taxon to the "Winged Victory" or "Victory of Samothrace".

***Philodendron wurdackii* Bunt., sp. nov. (Fig. 47)**

Herba scandens. Caulis usque ad 4 m longus 1.1 cm diam. laevis nudus internodiis 2-7 cm longis. Cataphyllum mox caducum. Pe-



tiolus spongiosus 8-14 cm longus adaxiale abaxialeque convexus, dimidio superiore lateraliter alato-angulosus et latior quam crassior (1.1-1.3 cm latus 0.6-0.9 cm crassus), parte vaginata 2-5.7 cm longa (in stirpe juvenili usque ad apicem vaginatus). Foliorum lamina in petiolo arrecta, coriacea anguste obovato-spathulata interdum basim versus contracta, 34-48 cm longa 7-12 cm lata, ad basim truncata vel emarginata, ad apicem obtusa vel acuta apice ipso acuminata (1-3 cm), adaxiale nitida laete viridis costa convexa prope basim 0.7 cm lata nervis lateralibus tenuibus subaequalibus sub angulo 50-60° exeuntibus, abaxiale pallide viridis glaucescens nitescens costa valde convexa aliquot nervis lateralibus a ceteris aegre distinguibilibus. Inflorescentiae solitariae ad ternae. Pedunculus 4-9.5 cm longus. Spatha 9-13 cm longa tubo 4.5-4.8 x 2 cm extra pallide viridi limbo cremicolori, intra ubique cremeo-alba. Spadix supra apicem spathae 0.5-1.2 cm exsertus, stipitatus stipite 0.2-1.3 cm longo, parte pistillata 2.3-3.5 x 0.8 cm, parte staminata 5.7-6.9 cm longa. Flores pistillati ovario 6-loculari loculis uniovulatis. Flores staminati 3-2-andri.

TYPUS: Bassett Maguire, John J. Wurdack & George S. Bunting 37446. Epiphyte in full sun; climbing to 2 m high. Spathe greenish. Occasional; upper Río Yaciba, between Cerro de la Neblina base camp and white-water affluents, Ríos Pacimoni-Yatúa, Depto. Río Negro, Territorio Federal Amazonas, 120-150 m, January 30-31, 1954 [Holotypus: NY].

PARATYPUS: Julian A. Steyermark & George S. Bunting 102595. Slender climber, to 4 m. Stem x 1.1 cm. Petiole spongy, convex adax., ca. 1 mm alate-angled on each side, more or less inflated. Blade coriaceous, flat, adax. glossy bright green, no veins salient; abax. pale green glaucescent, all veins fine & subequal (a few slightly stronger). Infls. 1-3 together. Spathe 13 cm long; tube pale green & x 2 cm, limb cream & glossy; inside creamy white. Spadix slightly exceeding spathe, 10.4 cm long, ca. 1.2 cm exposed. A lo largo del río Yatúa, margen izquierda, bajando desde el Cerro Araucaua, 1°35' N., 66°10' O., Depto. Río Negro, Territorio Federal Amazonas, 125 m, 14 de marzo, 1970 [VEN].

Pertains to Section *Oligospermium* Engl. *Philodendron wurdackii* is distinguished from *P. uleanum* Engl. and other similar species by the imperceptibility of primary lateral veins in the leaf blade. All veins are subequal in the dry specimen, although when alive, it is possible to discern primary laterals as slight depressions on the adaxial face. Furthermore, the inflorescences are proportionally very large. For these same reasons, *P. wurdackii* is also separated from *P. angustialatum* Engl., which has an alate petiole of similar form.

***Philodendron yavitense* Bunt., sp. nov. (Fig. 48)**

Herba scandens. Caulis ad 1.4 cm diam. nudus internodiis 0.7-0.9 cm longis (in parte inferiore ad 10.5 cm longis). Cataphyllum 12.7 cm longum ex viridi album margines versus hyalinum caducum. Petiolus rigidus abaxiale rotundatus adaxiale late canaliculatus dilute viridis 11-12 cm longus. Foliorum lamina in pe-

tiolo arrecta, coriacea attamen plus minusve fragilis anguste obovato-spathulata undulata 38-40 cm longa 9.3-9.7 cm lata (in loco 25-27 cm supra insertionem petioli), ad basim obtusa, ad apicem acuta vel fere obtusa apice ipso acuminata (2-3 cm), adaxiale saturate viridis glaucescens costa prope basim paulo concava 0.9 cm lata sursum plana vel paulo convexa nervis lateralibus 1. utrinque 7-8 sub angulo 65-70° prodeuntibus, totis nervis minoribus subaequalibus in ambabus paginis manifestis. Inflorescentia ignota.

TYPUS: George S. Bunting, L.M.A. Akkermans & J. van Rooden 3869. Climber, still juvenile apparently. Stem to 1.4 cm diam., internodes 7-9 mm long, light brown, clean. Cataphyll greenish-white, transparent toward margins. Petiole wide concave-channeled adax., stiff, light green, not geniculate. Blade erect on petiole, rich green glaucescent, l.'s 7/side, sulcate, margins sl. irreg. undulate, midrib sl. concave downward, flat to sl. convex above, x 9 mm below. Blade coriaceous, more or less brittle, very smooth. Alrededores de Yavita (río Temi) y cerca de la carretera Yavita-Pimichín hasta el km 5 hacia Pimichín, Depto. Casiquiare, Territorio Federal Amazonas, 124-140 m, 6-19 de julio, 1969 [Holotypus: NY; isotypi: U, VEN].

Whether the type specimen is adult remains to be determined, although the internodes are already abbreviated and the leaves much larger than those of another specimen collected in the same locality. Fertile material is necessary to resolve this question.

RHODOSPATA

Rhodospatha falconensis Bunt., sp. nov. (Fig. 49)

Herba scandens. Caulis usque ad 6 m longus 4 cm diam. internodiis 2.5 cm longis sed in parte florifera brevioribus. Cataphyllum gracile 22 cm longum. Petiolus laminam subaequans, e basi ad basim geniculi vaginatus alis diu persistentibus demum in fibris solutis; geniculum ca. 2.5 cm longum adaxiale canaliculatum. Foliorum lamina papyracea ovata 40-61 cm longa 15-24 cm lata, ad basim rotundato-subtruncata ex loco latissimo usque ad apicem contracta, adaxiale saturate viridis nitida, abaxiale ex luteolo pallide viridis, nervis lateralibus 1. numerosis ca. (1-)1.5-2.5 cm inter se distantibus sub angulo ca. 60° abeuntibus. Pedunculus 18.5 cm longus arcuato-nutans. Spatha (caudicula 2.2 cm longa inclusa) ca. 21 cm longa mox caduca. Spadix stipitatus stipite 1.2-1.5 cm longo, 15.5 cm longus 1.1 cm diam. (in sicco) ex aurantiaco roseus stigmatibus nigris glutinosis.

TYPUS: Robert Wingfield 8221A. Trepador herbáceo hasta 6 m, tallo hasta 4 cm (¿o más?) diam. Hojas con lámina hasta 61 x 24 cm. Pedúnculo curvado en más o menos 90°. Espádice más o menos horizontal, rosado algo anaranjado con estigmas negruzcos y glutinosos. Espata caída, muerta, marrón. Hojas con haz oscura y lustrosa, el envés más pálido y algo amarillento. Selva siempreverde más o menos natural; Sierra de San Luis, arriba de Uria, Edo. Falcón, 1360 m, 11 de abril, 1980 [Holotypus: IUTC].

Rhodospatha falconensis differs from *R. badilloi* Bunt. by having adult leaves with a shorter geniculum and a proportionally narrower blade of more delicate texture (in that, 1.8-2.1:1 and coriaceous), and from *R. moritziana* (Schott) Croat by its climbing habit and proportionally narrower leaf blades.

***Rhodospatha guasarensis* Bunt., sp. nov. (Fig. 50, 51)**

Herba scandens. Caulis usque ad 4 m longus 1.5 cm diam. internodiis 2-3 cm longis. Cataphyllum 23 cm longum. Petiolus 32-49 cm longus, e basi ad locum 5.7-0.5 cm infra basim geniculi vaginatus; geniculum 1.8-3.8 cm longum. Foliorum lamina papyracea elliptica vel elliptico-ovata vel -obovata 37-48 cm longa 15-22 cm lata, uterque extremitatem versus attenuata apice acuminata (1.5-3 cm) basi angustata, abaxiale nitida, adaxiale impolita numerosis nervis lateralibus I. sulcatis 0.7-1.5 cm inter se distantibus sub angulo 50-65° abeuntibus. Pedunculus erectus, longitudine 1/2 vel 2/3 petioli partes aequans 18-27 cm longus. Spatha spadice 6.5 cm vel ultra longior, 19-25 cm longa 8 cm diam. (applanata 18 cm lata) naviculariformis eburnea. Spadix stipitatus stipite 0.5-0.9 cm longo, 15 cm longus 1.4 cm diam. pallide armeniacus.

TYPUS: George S. Bunting, R.L. Liesner, A.J. Rosario T. & R. León 12256. Hierba trepando un árbol hasta 4 m pero suelta en parte terminal y floreciendo. Hoja mate en haz, lustrosa en envés, verde mediana. Inflorescencia solitaria; espata marfil y naviculi-forme, 25 x 8 cm (18 cm de ancho aplanada); espádice amarillo-anaranjado claro, 14.5 x 1.4 cm. En bosque nublado húmedo; alrededores del Puesto "El Bosque" de la Guardia Nacional, al oeste del río Guasare cerca de la frontera colombo-venezolana, 10°47'35" N., 72°40' O., Dtto. Mara, Edo. Zulia, 1450-1600 m, 14 de noviembre, 1982 [Holotypus: NY; isotypi: MO, VEN, VZM].

This species is distinguished by its small size and its leaf blades basally cuneate-angustate and marginally undulate.

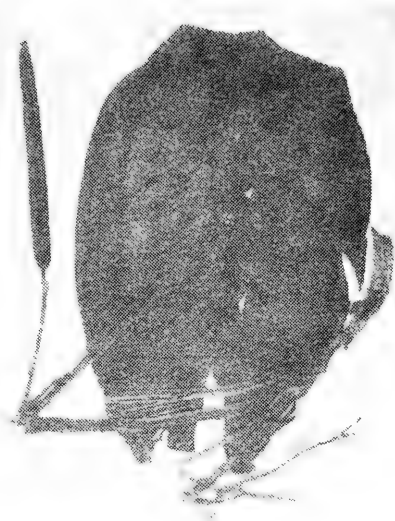
***Rhodospatha steyermarkii* Bunt., sp. nov. (Fig. 52)**

Herba scandens. Caulis ca. 1.3 cm diam. internodiis 2-3 cm longis. Petiolus 42-60 cm longus, e basi ad locum 6-3 cm infra basim geniculi vaginatus, alis siccantibus et longistrorsum dilacerantibus paulatim solutis; geniculum 4-5 cm longum. Foliorum lamina chartacea plus minusve elliptica vel elliptico-ovata 45-67 cm longa 21-27 cm lata (in loco paulo infra medium), in uterque extremitate obtusa basi ipsa angustata (2 cm) apice ipso acuminata (ca. 1 cm), inaequilatera latere altero quam alterum 0.7-3 cm latiore, adaxiale intense viridis nervis lateralibus I. sulcatis utrinque ca. 22 vel ultra 0.9-1.6 cm inter se distantibus sub angulo ca. 70-75° oreuntibus. Pedunculus 28-40 cm longus. Spatha ignota. Spadix stipitatus stipite 2.3-2.7 cm longo, 18-25 cm longus 1.5-2.2 cm crassus basi non obliquus.

TYPUS: Julian A. Steyermark & Marvin Rabe 96161. Climbing up tree; leaves chartaceous, deep green above, dull green below, sulcate conspicuously above, ribbed conspicuously below. Spadix erect, brownish, 2.5 cm diam. Laderas de selva siempreverde a lo



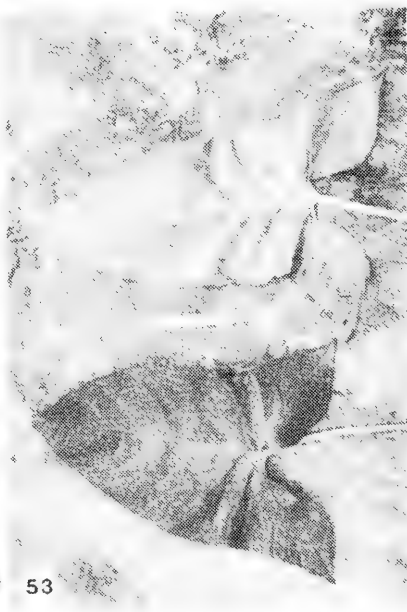
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largo de la Quebrada Nivardo, afluente del río Caverna, afluente del río Oscuro, arriba de Mundo Nuevo, al oeste del Cerro de Humo, Península de Paria, Edo. Sucre, 700-750 m, 7 de agosto, 1966 [Holotypus: VEN; isotypus: NY].

From *Rhodospatha moritziana* (Schott) Croat, this taxon differs by its climbing habit, considerably shorter petioles not even as long as the leaf blades (in that, to 1 m long and 1.2-1.7 times longer than leaf blades), and peduncles 2/3 or more of the length of the petiole (in that, only 1/3-1/2 as long as petiole).

STENOSPERMATION

Stenospermation ammiticum Bunt. subsp. **neblinae** Bunt., subsp. nov.

Herba ut videtur terrestre. Caulis elongatus per 70 cm distalia erectus, 1.3 cm diam. (in sicco) internodiis sursum 1.5 cm deorsum 2.5 cm longis. Petiolus usque ad basim geniculi vaginatus, 12.5-13.5 cm longus, is autem foliorum inflorescentias subtendentium 16-20 cm longus; geniculum 0.8 cm longum adaxiale sulcatum. Foliorum lamina elliptico-obovata uterque extremitate obtusa apice ipso acuminata (1 cm), quam petiolus ca. 1.5plo longior ca. 20 cm longa 8.5 cm lata, ea autem foliorum inflorescentias subtendentium tantum 0.6-0.8 petioli partes aequans ca. 13 cm longa 6 cm lata, adaxiale costa sulcata nervis lateralibus distinguibilibus (in sicco) 0.6-0.8 cm inter se distantibus sub angulo 45-50° prodeuntibus. Pedunculus solitarius erectus 25-31 cm longus, per 2.8 cm distalia geniculatus. Inflorescentia declinata. Spatha apice longe attenuata, 8.7 cm longa viridis caduca. Spadix spatha 3 cm brevior, 5 cm longa 0.9 cm diam. viridis stipite 1 cm longo.

TYPUS: Bassett Maguire, John J. Wurdack & George S. Bunting 37281. Vining, tip erect to 0.7 m. Spathe and spadix green, spathe becoming brown and abscissing. Midrib impressed. Geniculum somewhat channeled. Frequent; Cerro de la Neblina, upper slopes below northwest escarpment between Camp 4 and Cumbre Camp, summit, Territorio Federal Amazonas, 1700-2000 m, December 1953-January 1954 [Holotypus: VEN].

This subspecies differs from the typical one by its proportionally longer petioles (in respect to blade length), proportionally wider leaf blades, and nodding inflorescences.

XANTHOSOMA

Xanthosoma bolivaranum Bunt., sp. nov. (Fig. 54)

Herba grandis. Caulis erectus usque ad 30 cm longus. Petiolus viridis 1.17 m longus prope medium 2 cm latus 1.6 cm crassus, adaxiale canaliculatus canale 1 cm lato 0.2 cm profundo marginibus prominentibus sed non angulosis, sursum semiteres apicem versus adaxiale vix angulari-convexus 1.4 cm crassus, parte vaginata 54 cm longa. Foliorum lamina viridis ambitu plus minusve triangulari-ovata (in stirpe juvenili triangularis) ad 73 cm longa ca. 45 cm lata (insertione petioli opposita et trans lobos posticos), ad

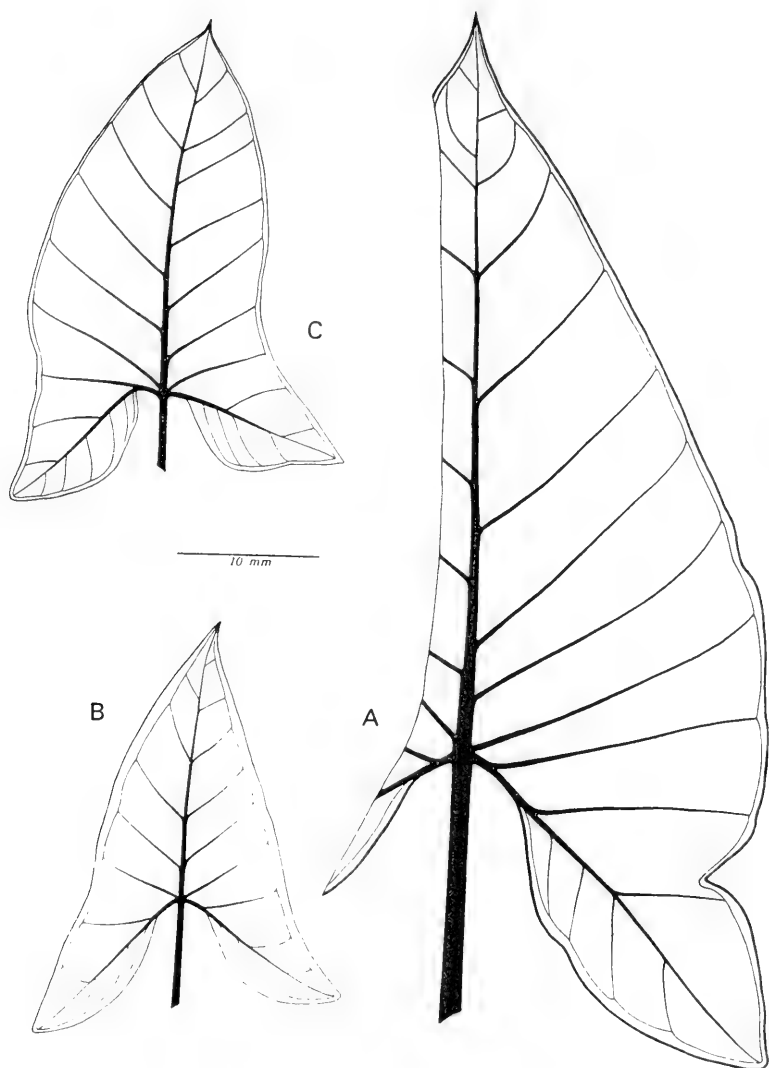


Fig. 54 A, B, Xanthosoma bolivaranum Bunt. A, adult leaf; B, juvenile leaf (both based on Bunting 3095). C, X. maroae Bunt., adult leaf (based on Steyermark & Bunting 102845).

apicem acuminata, ad basim plus minusve sagittata lobis posticis apicem versus attenuatis et valde acuto-angularibus apice ipso obtusis sinu 22.5 cm longo sejunctis, nervis lateralibus I. costalibus utrinque 7 sub angulo ca. 50-55° exeuntibus in nervum collectivum a margine 0.3-0.6 cm remotum conjunctis, costulis ca. 31 cm longis in sinu per 3-4 cm nudis nervis basalibus principalibus latere exteriori 3 latere interiore 4-5. Inflorescentia ignota.

TYPUS: George S. Bunting 3095. Erect herb in edge of forest. Trunks erect, to 30 cm long. Leaf blade dark green, leathery-rubbery. Not flowering. In dark, wet place in forest beside standing water, en selva alta y siempreverde; carretera El Dorado-La Gran Sabana, alrededores de km 87 de la vía, Edo. Bolívar, 200-400 m, 22 de febrero, 1968 [Holotypus: VEN].

Xanthosoma maroae Bunt., sp. nov. (Fig. 53, 54)

Herba acaulis. Caudex numerosa rhizomata tenuia rubra usque ad 34 cm longa 1 cm vel ultra diam. cataphyllis siccis producentibus colonia mox faciens. Petiolus ex purpureo-lavendulo viridis 47-77 cm longus parte vaginata 25-37 cm longa. Foliorum lamina 0.4-0.7 petioli partes aequans, membranacea (in sicco), adaxiale obscure viridis abaxiale ex purpureo pallide viridis, plerumque sagittata ambitu plus minusve triangularis attamen marginibus lateralibus supra medium convexis deorsum concavis, 29-43 cm longa ad 26 cm lata vulgo latissima trans apicem loborum posticorum unde apicem versus gradatim angustata apice ipso acuminata; lobi postici subrhombici plerumque divaricati secus costula 12-13.5 cm longi 7 cm lati, ad apicem angulosi apice ipso acuti vel obtusi sinu angulari-subrhombico (in vivo, sed in sicco subparabolico) 6-13 cm longo sejuncti, costulis in sinu per 1.5 cm nudis; nervi laterales I. costales utrinque 5-6 sub angulo 50-60° abeuntes in nervum collectivum a margine 0.2-0.45 cm remotum conjuncti, nervis validis basalibus latere exteriori 2-3 latere interiore 4-5. Pedunculus solitarius valde compressus 20-31 cm longus olivaceus pallidus sursum vinaceo-suffusus et -nervatus, cataphyllo angusto vinaceo nigricanti ad 35 cm longo subtentus. Spatha 16-19 cm longa extra impolita intra seminitida tubo 4.5-6 cm longo 2.6-2.9 cm diam. extra olivaceo nervis vinaceis et violaceo-marginato intra pallide viridi nervis vinaceis, limbo in ambabus paginis pallide olivaceo vel eburneo vinaceo-suffuso. Spadix spatha ad 5 cm brevior usque ad 13 cm longus, axe antice nudo ex violaceo eburneo, parte pistillata luteola 1.6(1.0) cm longa, parte staminata sterili violaceo-rubra 4.3 cm longa fertili rosea 6.8 cm longa.

TYPUS: Julian A. Steyermark & George S. Bunting 102845. Leaves suffused below with some purplish, petiole suffused with dull lavender; sterile. Sabana de arena blanca y bosque enano; 1 km al este de Maroa, 2°45' N., 67°35' O., río Guainía, Depto. Casiquiare, Territorio Federal Amazonas, 125 m, 20 de abril, 1970 [Holotypus: VEN].

PARATYPUS: George S. Bunting 4807. Cultivated in garden of George S. Bunting, Urb. Nueva Guayana, San Cristóbal, Edo. Táchira, from propagule of Steyermark & Bunting 102845 collected

near Maroa, Terr. Fed. Amazonas, specimen prepared 16 March 1975. Acaulescent herb producing numerous, slender, red rhizomes that soon give rise to colony of small plants around mother plant. Petiole suffused dull lavender. Blade abaxially suffused purplish. Floral cataphyll black-wine. Peduncle pale olive green upward suffused wine-colored. Spathe outside matte, tube olive green with wine veins and violet-edged, limb similar or dirty white, inside similar though tube semiglossy and limb matte ivory. Spadix with female part pale yellow, sterile male part red-violet and the fertile old rose; stipe ivory suffused violet. [NY].

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LIST OF TAXA DESCRIBED

Anthurium aroense	Philodendron dyscarpium var. venturianum
A. berryi	P. exile
A. guanchezii	P. guaiquinimae
A. huequeense	P. inaequilaterum subsp. anthoblastum
A. longissimum subsp. nirguense	P. liesneri
A. perijanum	P. marahuacae
A. subscriptum	P. multinervum
A. xanthoneurum	P. orionis
Caladium aturense	P. peraiense
C. steyermarkii	P. perplexum
Dracontium aricuaisanum	P. rhodoaxis var. angustifolium
D. changuango	P. sabulosum
Heteropsis spruceana var. robusta	P. strictum
H. steyermarkii	P. sucrensis
H. tenuispadix	P. tachirensis
Philodendron sect. Philopsammos	P. tatei subsp. melanochlorum
P. amplisinum	P. triangulare
P. anaadu	P. victoriae
P. appunii	P. wurdackii
P. borgesii	P. yavitense
P. calatheaifolium	Rhodopatha falconensis
P. canaimae	R. guasarensis
P. cataniapoense	R. steyermarkii
P. consobrinum	Stenospermata ammiticum subsp. neblinae
P. davidsei	Xanthosoma bolivaranum
P. delascioi	X. maroae

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A. berryi (Wood & Berry 95). Fig. 2, p. 294
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DELNORTEA, A NEW GENUS OF PERMIAN PLANTS

FROM WEST TEXAS

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In a preliminary publication Mamay, Miller and Rohr (1984) announced the discovery of a new Permian plant locality in the Del Norte Mountains, Brewster County, Texas. This is the youngest record of Paleozoic plant megafossils in North America.

The Del Norte flora contains abundant leaves of a new genus, heretofore referred to only as "gigantopteroid." Our full report on the considerable amount of available material is yet incomplete, but because of repeated inquiries regarding the nomenclature of this plant we herewith propose the generic name Delnortea, with the type-species D. abbottii. Inasmuch as only one species is recognized, a combined generic-specific diagnosis is presented.

DELNORTEA ABBOTTII Mamay, Miller, Rohr, and Stein, n. gen., n. sp.

Combined diagnosis: Leaves simple, petiolate, from 1.2 to an estimated 35.0 cm long, 0.8 to 8.5 cm wide. Petioles short, thick, with flaring, abscissed bases. Laminae symmetrical, each with a median groove on the adaxial surface; outlines orbiculate to oblong, elliptical, or linear; tips acute to obtuse; bases acute, rarely obtuse; margins shallowly to deeply crenate, rarely entire near the laminar base, and demarcated by a conspicuous, uninterrupted border of thickened tissue. Veins pinnate, in four orders. Primary vein (midrib) straight, stout, subterete in section, attached to the abaxial surface of the lamina by a major adaxial portion of the vein, beneath the median groove in the lamina. Secondary veins strong, straight, parallel, alternate to opposite, to 1.5 cm apart, acute, perpendicular or rarely obtuse, each vein terminating without branching at a marginal sinus in the lamina and merging into the

thickened laminar border. Tertiary veins strong, straight, parallel, numerous (less than 3.0 mm apart), broadly acute, those nearest the midrib arising directly from the midrib; tertiaries with diffuse endings, merging with those of tertiaries from the adjacent secondary; tertiaries and secondaries together forming a uniform, rigid "herringbone" pattern. Quaternary veins fine, numerous, acute, dividing sparsely; all ultimate vein endings coalescing with others to form a dense network of oblong meshes. Petiole and midrib containing heterogeneous ground tissue with clusters of isodiametric sclereids, a sclerified hypodermis and a vascular system of several conducting bundles arranged in a semicircular arc, the arc enclosed by a discrete boundary tissue; xylem and phloem in radial files separated by vascular rays; tracheids with scalariform-bordered secondary wall thickenings to uniseriate circular-bordered pits on all walls.

Holotype: Specimen 364416, Paleobotanical collections of the U.S. National Museum; Mamay, Miller, and Rohr, 1984, Fig. 1A.

Locality: Del Norte Mountains, Brewster County, Texas; 1.7 km south of Bird Mountain, southeast of Alpine (30°N).

Stratigraphic occurrence: Road Canyon Formation, Leonardian Series, Lower Permian.

Etymology: The generic name refers to the Del Norte Mountains, where the fossiliferous site occurs. The specific epithet acknowledges the assistance and friendship of our late colleague, Maxine L. Abbott.

Comments: The flared, abscissed petiole, the regularly crenate margins, the sinistral termination of the secondary veins, and the confluence of the secondaries with the thickened marginal border of the lamina are distinctive features that combine to separate Delnortea from all morphologically similar fossil plants; the ease with which hand specimens may be identified using external characters renders Delnortea a potentially valuable stratigraphic guide fossil. The internal anatomical details reflect an unusual type of fossilization and entail considerable phylogenetic interest.

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THE CHINESE MEDICINE "SHU"

4. Some Nomenclatural and Taxonomic Notes on the Atractylodes D.C. A.I. Baranov*

This is the last in a four-part series of papers on the Chinese medicine "shu", and it deals with taxonomy and nomenclature of the "shu" source plants.

Atractylodes DC. is not a well known group of plants in the West. Conversely, in the Far East this genus is well known and economically very important because its members yield an herbal medicine extremely popular in Korea, Japan and China. In China the four species of Atractylodes used in traditional Chinese medicine are known under the generic name of "shu."

The genus Atractylodes was established by De Candolle in 1838. It belongs to the family Compositae, subfamily Asteroidae and the tribe Cynarae (Cardueae) [1].

Although the genus is small (not more than ten species), its intrageneric taxonomy is very confused and needs a thorough revisionary study. However, for various reasons this author is not in a position to carry out such a study. Consequently, he compiled this paper to fill the gap provisionally until a more comprehensive account of the taxonomy of this genus can be produced. Thus, herein will be presented seven remarks identifying the most important deficiencies and areas requiring improvement in the taxonomy of the genus.

1) The first two members of the genus Atractylodes were described by C.P. Thunberg. He found the plants cultivated in Japan (1775-1776) during his stay in that country. Thunberg referred the plants to the genus Atractylis L. and described two species: Atractylis lancea and A. ovata [9].

Later, botanists found that the natural distribution of the genus Atractylis L. is within the limits of the Mediterranean Region. Consequently, De Candolle established in 1838 a new genus Atractylodes and transferred all East Asian species of Atractylis into this new genus.

Certain specialists on East Asian flora do not recognize the genus Atractylodes as a separate genus, allegedly because it has no significant differences from Atractylis in the

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structure of generative parts. A comparative study by this author showed that besides the marked differences from Atractylis in the structure of vegetative parts, the genus Atractylodes differs from the genus Atractylis L. as follows: (a) The heads of Atractylis are homogamous (florets all perfect), while in Atractylodes DC. the heads are heterogamous (florets are either all perfect or all pistillate with aborted stamens) [2,5]; (b) in Atractylis L. the receptacle is chaffy; chaffs are oblong-ovate or linear, dissected into two lobes, of which one is short ovate, acute; another one is very long, awn-like, very narrow; in addition, the chaffs are ciliate and slightly erose at the margin; (Fig. 1 d,e,f) in Atractylodes DC. the receptacle is bristly; bristles are simple, linear, narrow, entire, not ciliate at the margin. (Fig. 1 c); (c) Another's appendages in Atractylis L. are very narrow, linear, drawn out into a very long, sharp apex, very densely, minutely, flexuously hairy (Fig. 1. g); in Atractylodes DC. the appendages are oblong or narrowly ovate, sometimes lobate, obtuse or acutish at the apex; on the surface they are rather loosely beset with minute, straight hairs (Fig. 1 a,b).

Thus, in this author's opinion the characteristics described above are sufficient to recognize the genera Atractylis L. (1737) and Atractylodes DC. (1838) as two separate genera.

2) In the Flora USSR[1] it is said that the type species of the genus Atractylodes DC. is A. lancea (Thunb.) DC. However, in the ING[3] it is said about the type species of Atractylodes DC.: "Typus non designatus." The explanation for this contradiction is found in Professor Bobrov's personal letter to this author [1a], in which he says that he selected A. lancea (Thunb.) DC. as the type of the genus, for purely formal reasons, i.e. because this species is cited first in the protologue of the genus. No typification whatsoever of the genus Atractylodes DC. has ever been made and this genus, so far, has no officially designated nomenclatural type.

3) In the latest handbook of the Soviet Far Eastern Flora [10] the authority of the genus Atractylodes is cited in an erroneous way. It reads: Atractylodes L., while it should read Atractylodes DC.

4) The diagnoses of the two first species of Atractylodes, Atractylodes ovata (Thunb.) DC. and A. lancea (Thunb.) DC. are extremely short (each consists of only nine words) [9]. Naturally, such short descriptions are unable to give any clear idea of the species. Although these species are still treated as two distinct species, although with a rather

doubtful taxonomic status, Bobrov[1a] suggests that it might have happened that Thunberg described not two separate species, but two cultivated varieties of one species. This certainly should be verified. In addition, the fact that Thunberg described these taxa from cultivated plants, disproves the old notion that the type locality of the genus Atractylodes DC. is in Japan. This in turn poses a question: In what part of continental Eastern Asia then is the original native area of distribution of A. ovata?

5) Atractylodes separata Bailey listed by Hu[4] as occurring in China (prov. Hupei, Szechuan) is conspecific, according to Koidzumi[6] with A. lancea (Thunb.) DC.

6) A. japonica Koidz. ex Kitam. This species of Atractylodes ought to be critically revised because it apparently has been published with serious violations of the rules of ICBN: (a) no formal description of this species at the time of its publication was provided; consequently, A. japonica is nomen nudum; (b) the nomenclatural type of this taxon has never been designated; (c) there are serious doubts with regard to the relationship of A. japonica and A. ovata; it seems that diagnostic characteristics of both species overlap, at least in part. Thus, it appears to be advisable for the Japanese botanists to re-study, re-describe or re-validate the publication of A. japonica Koidz. ex Kitam in the future.

7) A. pinnatifolia (Kom.) S.Y. Hu. A new species of Atractylodes proposed by Hu[4]. Taxonomic status of this species seems to be questionable because it is described on the basis of only one herbarium specimen. Furthermore, separation of this taxon is based, for the most part, on the plant's leaf shape. However, there is a general rule that in the genus Atractylodes DC., leaf shape cannot be used as a diagnostic characteristics because it is extremely changeable [1,7,8].

It is hoped that this sharing of information about the problem with regard to the taxonomy of the genus Atractylodes will serve as a springboard for the beginning of a revisionary study of this genus.

The author is grateful to the late Professor E. G. Bobrov, (Leningrad), Dr. S.Y. Hu (Arnold Arboretum, Harvard University), and Dr. M. Kitagawa (Tokyo, Japan) for their valuable help during the preparation of this paper. He is also grateful to Harvard University Herbaria and Library for making available the herbarium material and literature necessary for the writing of this paper.

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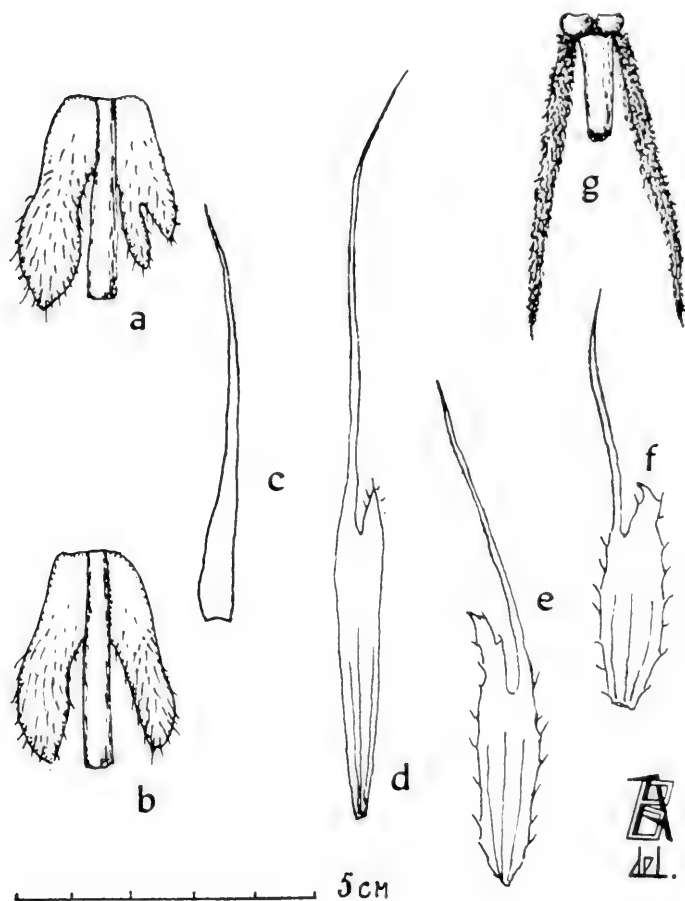


Fig. 1

Receptacle scales and anther appendages in Atractylis L. and Atractylodes DC.

Atractylodes DC.: a and b - anther appendages; c - receptacle bristle. a and b X ca. 20; c X ca. 5.

Atractylodes ovata (Thunb) DC.: Kirin, Manchuria, Wasteland. Coll. F. H. Chen. No. 141. 24-VII-1931 [GH].

Atractylis L.: d, e, f - receptacle chaffs; g - anther appendages. d, e, f and g X ca. 15.

Atractylis cancellata L. Acroteri, Crete. E. Rieverchon ex Herb. John Ball. 1890. [GH].

NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). XXI

Harold N. Moldenke

This series of notes was begun in *Phytologia*, volume 57, page 157 (1985), and has been continued in almost every succeeding issue, the species being treated in alphabetic sequence. Since the series was begun numerous additions and emendations have come to light and these will be included in the present installment before continuing with the alphabetic sequence where it was left off in the preceding issue. For explanation of the herbarium acronyms employed refer to the first installment.

CLERODENDRUM Burm.

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It is of interest to note, in passing, that Trimen (1895) asserts that the generic name, *Clerodendrum*, was actually first proposed for this group of plants by Hermann, who so translated the Sinhalese vernacular name, "pinnakola", applied by them to *C. infortunatum* L.

CLERODENDRUM ACERBIANUM (Visiani) Benth.

Additional bibliography: Mold., Phytologia 59: 462 (1986) and 60: 60. 1986.

CLERODENDRUM ACULEATUM (L.) Schlecht.

Additional bibliography: Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 590 (1935) and imp. 2, 1: 590. 1965; Mold., Phytologia 59: 462--463 & 494 (1986) and 60: 130. 1986.

Burkill (1935) describes this plant as having "white or purple flowers" and that it "has been found very useful for hedges in the West Indies, and may be of service in Malaya". A key to help distinguish it from other Cuban taxa can be found under *C. grandiflorum* (Hook.) Schau. in the present series of notes (60: 130).

CLERODENDRUM ACULEATUM var. **GRACILE** Griseb. & Mold.

Additional bibliography: Mold., *Phytologia* 57: 462--464 (1985) and 58: 181. 1985.

CLERODENDRUM ACULEATUM var. **GUYANENSE** Mold.

Additional & emended bibliography: Mold., *Geogr. Distrib. Avicenn.* 22. 1939; Mold., *Phytologia* 57: 464--465. 1985.

CLERODENDRUM ADENOPHYSUM H. Hallier

Additional bibliography: Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Phytologia* 57: 465--468 (1985) and 58: 291 & 353. 1985.

CLERODENDRUM AGGREGATUM Gürke

Additional bibliography: Mold., *Phytologia* 57: 468--469 (1985) and 58: 189. 1985.

A key to distinguish this species from the other known taxa in Madagascar will be found under *C. baronianum* Oliv. in the present series of notes (58: 189).

CLERODENDRUM ALATUM Gürke

Additional bibliography: Mold., *Phytologia* 58: 329 & 443. 1985.

A key to help distinguish this species from some other western tropical African species of the subgenus *Cyclonema* may be found under *C. carnosulum* J. G. Baker in the present series of notes (58: 443).

CLERODENDRUM ALBIFLOS H. J. Lam

Additional bibliography: Mold., *Phytologia* 57: 472--473 (1985) and 58: 349 & 352. 1985.

CLERODENDRUM ALBIFLOS var. **GLABRIOR** (Gibbs) H. J. Lam

Additional bibliography: Mold., *Phytologia* 57: 473 (1985) and 58: 352. 1985.

CLERODENDRUM ALBOVIOLACEUM Mold.

Additional bibliography: Mold., *Phytologia* 57: 474 (1985) and 58: 187. 1985.

A key to distinguish this species from the many other taxa in Madagascar will be found under *C. baronianum* Oliv. in the present series of notes (58: 187).

CLERODENDRUM ALBUM Ridl.

Additional bibliography: Mold., *Phytologia* 57: 474--475 (1985) and 59: 424. 1986.

CLERODENDRUM ANAFENSE Britton & P. Wils.

Additional bibliography: Mold., *Geogr. Distrib. Avicenn.* 5 & 37. 1939; Mold., *Phytologia* 59: 101 & 252 (1986) and 60: 131. 1986.

A key to help distinguish this species from other Cuban taxa is given under *C. grandiflorum* (Hook.) Schau. in the present series of notes (60: 131).

CLERODENDRUM ANGOLENSE Gürke

Additional & emended bibliography: DeWild., Compt. Rend. Hebdomad. Seanc. Mem. Soc. Biol. 72: 582. 1920; B. Thomas, Engl. Bot. Jahrb. 68; [Gatt. Clerod.] 6, 13, 26, 36, 62--63, 92, & 93. 1936; Grout de Beaufort & Schnell, Mém. Inst. Fond. Afr. Noire 75: [7], 9, 40, & 41. 1966; Mold., Phytologia 58: 330 & 421 (1985), 59: 355, 357, 358, & 407 (1986), and 60: 138. 1986.

A key to help distinguish this species from some other tropical west African species of the genus will be found under *C. guerkei* J. G. Baker in the present series of notes (60: 138) as *C. poggei* Gürke.

The *Louis 1035*, distributed as *C. angolense* and so determined by P. Staner, is actually *C. grandifolium* Gürke, while *Hendrickx 849* is *C. grandifolium* var. *cuneatum* (DeWild.) Thomas.

CLERODENDRUM ANGUSTIFOLIUM (Poir.) Spreng.

Additional bibliography: Bojer, Hort. Maurit. 256. 1837; Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Phytologia 59: 101 & 469 (1986) and 60: 187 & 188. 1986.

Salisbury's use of the epithet "*angustifolium*" in 1796 was illegitimate and invalid when proposed, being merely a substitute name for Linnaeus' *C. fortunatum*, and therefore does not preclude its later use by Sprengel in this genus.

It is also worth noting that Bojer (1837) regarded *Volkameria angustifolia* Lam. and *Clerodendrum ligustrinum* R. Br. as synonyms of *C. heterophyllum* (Vent.) R. Br. and, indeed, they are obviously very closely related taxa, although apparently distinct.

CLERODENDRUM ARENARIUM J. G. Baker

Additional bibliography: Mold., Phytologia 57: 485--488 (1985), 58: 185 & 188 (1985), and 59: 342. 1986.

A key to help distinguish this species from other Madagascar taxa can be found under *C. baronianum* Oliv. in the present series of notes (58: 188).

CLERODENDRUM ARENARIUM var. **MACROCALYX** Mold.

Additional bibliography: Mold., Phytologia 57: 487 (1985) and 58: 188. 1985.

A key to distinguish this plant from the other known Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 188).

CLERODENDRUM AUCUBIFOLIUM Hemsl.

Additional bibliography: Baron, Rev. Madag. 363. 1906; Mold., Phytologia 57: 488--490 (1985), 58: 185 & 187 (1985), and 59: 348. 1986.

A key to help distinguish this species from the other known taxa in Madagascar may be found under *C. baronianum* Oliv. in the present series of notes (58: 187).

CLERODENDRUM AUCUBIFOLIUM var. **GIGANTEUM** Mold.

Additional bibliography: Mold., Phytologia 57: 489 (1985) and 58: 185. 1985.

A key to distinguish this plant from the other known Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 185).

CLERODENDRUM AUCUBIFOLIUM var. **LONGIFLORUM** Mold.

Additional bibliography: Mold., *Phytologia* 57: 490 (1985) and 58: 185. 1985.

A key to distinguish this plant from the other Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 185).

CLERODENDRUM BAKHUIZENI Mold.

Additional synonymy: *Clerodendron glaucum* Wall. ex Steud. apud Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 109. 1921.

Additional bibliography: Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 561. 1893; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 95 & 109. 1921; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 561 (1946) and imp. 3, 1: 561. 1960; Grindal, *Every-day Gard. India*, ed. 16, 55. 1960; Mold., *Phytologia* 36: 37 (1977) and 58: 180--182. 1985.

Grindal (196) describes *C. glaucum* as "a tall, erect, rampant shrub" cultivated in India. Bakhuizen (1921) lists it among his "Species unknown to me, or doubtful".

CLERODENDRUM BARBA-FELIS H. Hallier

Additional bibliography: Mold., *Phytologia* 58: 182--183 (1985) and 59: 409. 1986.

CLERODENDRUM BARONIANUM Oliv.

Additional bibliography: Mold., *Phytologia* 58: 183--190, 203, 283, 447, & 450 (1985), 59: 103, 242, 342, 347, 352, 408, & 411 (1986), and 60: 133, 196, 200, & 274. 1986.

CLERODENDRUM BELLUM Mold.

Additional bibliography: Mold., *Biol. Abstr.* 26: 185. 1952; Mold., *Phytologia* 58: 185 & 191--192. 1985.

A key to distinguish this species from the other known taxa of the genus in Madagascar will be found under *C. baronianum* Oliv. in the present series of notes (58: 185).

CLERODENDRUM BETHUNIANUM Low

Additional bibliography: Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Phytologia* 58: 330, 342, & 407 (1985), 59: 101--103 & 492 (1986), and 60: 131, 150, 267, & 274. 1986.

CLERODENDRUM BINGAENSE S. Moore

Additional bibliography: Mold., *Phytologia* 58: 199--200 (1985) and 59: 109. 1986.

CLERODENDRUM BIPINDENSE Gürke

Additional bibliography: Mold., *Phytologia* 58: 200--201 & 299.

1985.

CLERODENDRUM BOTRYODES (Hiern) J. G. Baker

Additional & emended bibliography: Pellegrin, Fl. Mayombe 2: 50. 1928; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 8, 9, 13, 16, 41, 70, 92, & 93. 1936; Mold., Phytologia 58: 204--207, 298, & 299. 1985.

CLERODENDRUM BRACHYANTHUM Schau.

Additional bibliography: Quisumb., Philip. Dept. Agr. Tech. Bull. 16: 785--786. 1951; Mold., Phytologia 58: 207--209 & 349. 1985.

CLERODENDRUM BRACTEATUM Wall.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 58: 209--214, 415--417, & 460 (1985), 59: 103 & 251 (1986), and 60: 135 & 136. 1986.

Keys to help distinguish this species from other Assam and Indian taxa in this genus will be found under *C. griffithianum* C. B. Clarke in the present series of notes (60: 135).

The *Ward 155*, distributed as *C. bracteatum*, actually is *C. griffithianum* C. B. Clarke.

CLERODENDRUM BRACTEATUM var. *BÜNNEMEIJERI* Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 58: 212. 1985.

CLERODENDRUM BRACTEATUM var. *SUMATRANUM* Ridl.

Additional bibliography: Mold., Resume Suppl. 15: 18. 1967; Mold., Phytologia 58: 211--214 & 349 (1985) and 59: 103. 1986.

CLERODENDRUM BRASSII Beer & Lam

Additional bibliography: Mold., Phytologia 58: 215--216 (1985) and 60: 190. 1986.

CLERODENDRUM BREVIFLORUM Ridl.

Additional & emended bibliography: Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 590 (1935) and imp. 2, 1: 590. 1965; Mold., Phytologia 58: 183 & 216--218. 1985.

CLERODENDRUM BRUNNESCENS Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 185. 1952; Mold., Phytologia 58: 281--282. 1985.

A key to distinguish this species from the other known Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 197).

CLERODENDRUM BRUNSVIGIOIDES J. G. Baker

Additional bibliography: Mold., Phytologia 58: 282--283. 1985.

A key to help distinguish this species from the other known Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 188).

CLERODENDRUM BUCHANANI (Roxb.) Walp.

Additional & emended bibliography: Guerrero, Bull. Philip. Bur. Forest. 22: 229. 1921; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 590. 1935; Mold., Geogr. Distrib. Avicenn. 37. 1939; Quisumb., Philip. Dept. Agr. Tech. Bull. 16: 785. 1951; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 63--69, 71, & 89. 1942; Lam & Meeuse in Holthuis & Lam, Blumea 5: 235--236 & 768. 1945; Mold., Biol. Abstr. 26: 1471. 1952; Burkill, Dict. Econ. Prod. Malay Penins., imp. 2, 1: 590. 1965; Mold., Phytologia 59: 101 & 106 (1986) and 60: 266. 1986.

A key to distinguish this species from other Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 186).

The "*Holthuis 2485, 3094, & 3414*", cited by me in 58: 290, should have been cited as *Lam 2485, 3094, & 3414*.

CLERODENDRUM BUCHANANI f. **BREVIFLORUM** Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 58: 293. 1985.

CLERODENDRUM BUCHANANI var. **GLABRUM** (H. J. Lam) Mold.

Additional bibliography: Mold., Known Geogr. Distrib. Verbenac., ed. 1, 66 & 89. 1942; Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 59: 101. 1986.

CLERODENDRUM BUCHHOLZII Gürke

Additional bibliography: Mold., Phytologia 59: 102 & 254 (1986) and 60: 271. 1986.

Keys to distinguish this species from other tropical African species will be found under *C. dinklagei* Gürke and *C. inaequipetiolatum* Good in the present series of notes (59: 253 & 60: 271).

Additional citations: CULTIVATED: Oregon: Rankin s.n. [Coquille, August 29, 1947] (Or--62644).

CLERODENDRUM BUCHNERI Gürke

Additional bibliography: H. N. & A. L. Mold., Pl. Life 2: 56 & 64. 1948; Mold., Phytologia 59: 102 (1986) and 60: 268. 1986.

Thomas (1936) is of the opinion that *C. humile* Chiov. may be conspecific with *C. buchneri*, differing only in its smaller stature and shorter corolla-tube.

CLERODENDRUM BUKOBENSE Gürke

Additional bibliography: Mold., Phytologia 58: 330--332 (1985) and 59: 266. 1986.

CLERODENDRUM BUNGEI Steud.

Additional synonymy: *Clerodendrum bungei* Needham, Sci. Civilis. China 6 (1): 53 sphalm. 1986.

Additional bibliography: Backer, Tropische Natuur 5: 90, 93, & 94. 1916; Mold., Geogr. Distrib. Avicenn. 3, 4, 14, 26, & 29. 1939; D. E. Clark, Sunset New West. Gard. Book, imp. 1, 247 (1967) and imp. 2, 247. 1979; Phillips & Barber, Ornament. Shrubs 110. 1981; Wright,

Miner, & Carter, Compl. Handb. Gard. Pl. 216 & [217], fig. 4. 1984: Clewell, Guide Vasc. Pl. Fla. Panhandle 510 & 511. 1985; Mold., Phytologia 59: 102 (1986) and 60: 141 & 180. 1986; Needham, Sci. Civilis. China 6 (1): 672. 1986.

Additional illustrations: Wright, Miner, & Carter, Compl. Handb. Gard. Pl. [217], fig. 4 (in color). 1984.

Phillips & Barber (1981) describe this species as "an 8 ft. suckering shrub, developing into a thicket if allowed. It is thickly draped with large, heart-shaped, toothed leaves and decorated in due season with 5 in wide orbs composed of fairly tightly clustered, tubular, expanded florets of rosy-red, like red snowballs. In severe winters it may be killed to the ground, but quickly shoots up again. Prune in late winter, lightly in mild climates, severely in cold ones. Propagate from its own suckers and use them as replacement shoots."

A key to distinguish this species from other Chinese and Indo-chinese taxa will be found under *C. henryi* P'ei and *C. hahnianum* Dop in the present series of notes (60: 180 & 60: 141) and from other cultivated taxa in the Hawaiian Islands under *C. indicum* (L.) Kuntze.

CLERODENDRUM BURUANUM Miq.

Additional bibliography: Mold., Phytologia 58: 348--353 (1985) and 59: 106. 1986.

CLERODENDRUM BURUANUM f. *LINDAWIANUM* (Lauterb.) Bakh.

Additional bibliography: Mold., Phytologia 58: 349--353 (1985) and 59: 106. 1986.

CLERODENDRUM BÜTTNERI Gürke

Additional bibliography: Mold., Phytologia 58: 353--355 (1985) and 59: 254. 1986.

A key to help distinguish this species from other tropical African species will be found under *C. dinklagei* Gürke in the present series of notes (59: 254).

CLERODENDRUM CALAMITOSUM L.

Additional bibliography: P. Mill., Gard. Dict., ed. 9, 1: *Clerodendrum* 4. 1797; Willd. in L., Sp. Pl., ed. 4 [5], 3 (1): 386. 1800; Backer, Tropische Natuur 5: 92 & 93. 1916; Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 589 & 590. 1935; Mold., Geogr. Distrib. Avicenn. 37. 1939; Burkill, Dict. Econ. Prod. Malay Penins., imp. 2, 1: 589 & 590. 1965; Lopez-Palacios, Fl. Venez. Verb. 263. 1977; Mold., Phytologia 59: 102, 321, 328, 340, & 409 (1986) and 60: 142. 1986.

Keys to help distinguish this species from other Indochinese and Madagascar species of the genus will be found under *C. hahnianum* Dop and *C. baronianum* Oliv. in the present series of notes (60: 142 & 58: 186).

CLERODENDRUM CALCICOLA Britton

Additional bibliography: Mold., Geogr. Distrib. Avicenn. 5. 1939;

Mold., *Phytologia* 58: 409--410 (1985) and 60: 130 & 131. 1986.

A key to help distinguish this species from the other known taxa in Cuba will be found under *C. grandiflorum* (Hook.) Schau. in the present series of notes (60: 130 & 131).

CLERODENDRUM CANESCENS Wall.

Additional bibliography: Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Phytologia* 58: 413--417 (1985), 59: 470 (1986), and 60: 141 & 180. 1986.

Keys to help distinguish this species from other Chinese and Indo-chinese taxa will be found under *C. henryi* P'ei and *C. hahnianum* Dop in the present series of notes (60: 180 & 60: 141).

CLERODENDRUM CAPITATUM (Willd.) Schum. & Thonn.

Additional bibliography: Willd. in L., *Sp. Pl.*, ed. 4 [5], 3 (1): 384. 1800; Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Phytologia* 59: 102, 353, 358, 413, 414, & 472--474. 1986.

CLERODENDRUM CAPITATUM var. *CEPHALANTHUM* (Oliv.) J. G. Baker

Additional bibliography: Mold., *Geogr. Distrib. Avicenn.* 37. 1939; Mold., *Phytologia* 59: 102, 415, & 474. 1986.

CLERODENDRUM CAPITATUM var. *CONGLOBATUM* (J. G. Baker) Thomas

Additional bibliography: Mold., *Phytologia* 58: 436--439 (1985) and 59: 353, 414, & 415. 1986.

CLERODENDRUM CAPITATUM var. *TALBOTII* (Wernham) Thomas

Additional bibliography: Mold., *Phytologia* 58: 440--442 (1985) and 59: 474. 1986.

CLERODENDRUM CAPITATUM var. *VANDERVYSTI* Mold.

Additional bibliography: Mold., *Phytologia* 58: 442 (1985) and 59: 358. 1986.

CLERODENDRUM CARNOSULUM J. G. Baker

Additional bibliography: Prain, *Ind. Kew. Suppl.* 3: 44. 1908; Mold., *Phytologia* 58: 442--444.

CLERODENDRUM CAULIFLORUM Vatke

Additional bibliography: Mold., *Phytologia* 58: 445--447. 1985.

A key to distinguish this species from the other known taxa in Madagascar will be found under *C. baronianum* Oliv. in the present series of notes (58: 185).

CLERODENDRUM CERAMENSE Mold.

Additional bibliography: Mold., *Biol. Abstr.* 26: 1471. 1952; Mold., *Phytologia* 58: 447--448. 1985.

CLERODENDRUM COCHINCHINENSE Dop

Additional bibliography: Mold., *Phytologia* 58: 453--454 (1985) and 60: 143. 1986.

A key to distinguish this species from other Indochinese species will be found under *C. hahnianum* Dop in the present series of notes (60: 143).

CLERODENDRUM COLEBROKIANUM Walp.

Additional bibliography: Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Phytologia 59: 102--103 (1986) and 60: 62, 135, 141, 152, & 181. 1986.

Keys to help distinguish this species from other Chinese, Indian, and Thai taxa of *Clerodendrum* will be found under *C. henryi* P'ei, *C. griffithianum* C. B. Clarke, *C. hahnianum* Dop, and *C. inerme* (L.) Gaertn. in the present series of notes (60: 181, 60: 134, 60: 141).

CLERODENDRUM COLEBROKIANUM var. **FORBESII** King & Gamble

Additional bibliography: Mold., Phytologia 58: 461--462 (1985) and 60: 62. 1986.

CLERODENDRUM COMANS Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 185. 1952; Mold., Phytologia 59: 103. 1986.

CLERODENDRUM CONFUSUM H. Hallier

Additional synonymy: *Clerodendron infortunatum* x *villosum* Backer, Tropische Natuur 5: 90. 1916.

Additional bibliography: Backer, Tropische Natuur 5: 90. 1916; Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., Phytologia 59: 103--107. 1986.

Backer (1916) suggested that Backer 22055 and Hallier s.n. [14. VIII.1890] represent a natural hybrid between *C. infortunatum* L. and *C. villosum* Blume. I regard both collections as typical *C. confusum* H. Hallier. He described the supposed hybrid as "Kroombois 10--12 mm lang, ongeveer even lang als de kelk. Bladeren breed eirond met zwak hartvormigen, afgeronden of zeer stompen voet, 6--18 cm lang, 4½--13½ cm breed. Overigens gelijk aan de voorgaande [*C. infortunatum*]. Op een paar plaatsen bij Buitenzorg gevonden....Deze soort ze door den rooden vruchtkelk en de kortere, veel minder dichte beharing, van de tweede door de veel kortere kroombuis."

CLERODENDRUM CORDIFOLIUM (Hochst.) A. Rich.

Additional bibliography: Mold., Phytologia 59: 110--112, 255, & 477. 1986.

A key to distinguish this species from some other tropical African species will be found under *C. dinklagei* Gürke in the present series of notes (59: 255).

CLERODENDRUM COSTARICENSE Standl.

Additional bibliography: Mold., Geogr. Distrib. Avicenn. 17. 1939; Mold., Phytologia 59: 133. 1986.

CLERODENDRUM CUBENSE Schau.

Additional bibliography: Mold., Geogr. Distrib. Avicenn. 5. 1939;

Mold., *Phytologia* 59: 115--117 (1986) and 60: 130 & 131. 1986.

A key to help distinguish this species from other known Cuban species will be found under *C. grandiflorum* (Hook.) Schau. in the present series of notes (60: 130).

The *Alain & Killip 2008* and *C. Wright 502* [71; Herb. Sauvalle 1779 in part], distributed as *C. cubense*, actually are *C. grandiflorum* (Hook.) Schau.

CLERODENDRUM CUMINGIANUM Schau.

Additional bibliography: Guerrero, Philip. Bur. Forest. Tech. Bull. 22: 229. 1921; Quisumb., Philip. Dept. Agr. Tech. Bull. 16: 786. 1951; Mold., *Phytologia* 59: 117--119. 1986.

CLERODENDRUM CUNNINGHAMII Benth.

Additional bibliography: Mold., Geogr. Distrib. Avicenn. 37. 1939; Mold., *Phytologia* 59: 121--123, 423, & 424. 1986.

CLERODENDRUM CYRTOPHYLLUM Turcz.

Additional & emended synonymy: *Clerodendron glaberrima* Hayata ex Kawakami, List Pl. Formosa 84. 1910. *Clerodendron glaberrimum* Hayata, Journ. Coll. Sci. Imp. Univ. Tokyo 30: 216--217. 1911.

Additional & emended bibliography: Hayata, Journ. Coll. Sci. Imp. Univ. Tokyo 30: [Mat. Fl. Formosa] 216--217. 1911; Mold., *Phytologia* 59: 234--240 & 339 (1986) and 60: 142, 144, & 181. 1986.

Keys to distinguish this species from other Chinese species will be found under *C. canescens* Wall. and *C. henryi* P'ei in the present series of notes (58: 416 and 60: 181).

The synonymous *C. glaberrimum* is based on *Hayata & Mori 7045* from Randaizan, Taiwan, collected in August of 1908. Hayata (1911) comments about it: "Remarkable for its glabrous leaves, retaining its fresh green colour even in a dried specimen, and quite glabrous panicles. Near *C. acuminatum* Wall. and *C. disparifolium* Blume, but differs from them in having smaller flowers, more profusely dichotomous cymes, and oblanceolate leaves."

Additional citations: MOUNTED ILLUSTRATIONS: Itô, Taiwan Shokubutsu Zusetsu 598. 1928 (Ld).

CLERODENDRUM DECARVI Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 185. 1952; Mold., *Phytologia* 59: 242--243. 1986.

CLERODENDRUM DEFLEXUM Wall.

Additional bibliography: Burkill, Dict. Econ. Prod. Malay Penins., imp. 1, 1: 590-591 (1935 and imp. 2, 1: 590--591. 1965; Mold., *Phytologia* 59: 243--247 & 402. 1986.

Emended illustrations: Wall., Pl. Asiat. Rar. 3: 10, pl. 215. 1831.

A key to distinguish this species from other Thai taxa will be found under *C. inerme* (L.) Gaertn. in the present series of notes.

Additional citations: MOUNTED CLIPPINGS & ILLUSTRATIONS: Wall., Pl. Asiat. Rar. 3: 10, pl. 215. 1831 (Ld, Ld).

[to be continued]

PLANTAE MESOAMERICANAE NOVAE. XII.

Pór Luis D. Gómez P & Jorge Gómez-Laurito
Museo Nacional de Costa Rica, San José, C. R.

Elaphoglossum ometepense L. D. Gómez sp. nov., rhizomate brevis, paleis lanceolatis, brunneis, rigidis sparse obtectis, stipitibus 20-22(25) cm longis, erectis, rigidis, subteretibus, 2.5-3 mm crassis, antrorsum sulcatis, paleis elliptico-lanceolatis, obtusis, subdenticulatis, peltatis, fuscescentibus imbricatis, phyllopodia nulla; limbo sterili elongato-elliptico, ad basim rotundato-subtruncato deinde subcuneato, ad apicem retusissimo, proliferans, 25-28 (vix 30 ?) cm longo e medio vix 10 cm lato. Costa straminea subtus exserta, pauce stipitibusque paleacea. Lamina opaca, virides, marginibus pauce et sparse paleis avellaneis, tenuissime ornata. Venis (2-5/cm ad costam) crassis marginibus non attingentibus, hydatoda nigrescentia. Sporae reniformes, 40(42.6)44 x 24.8(28.4)26 μ m, cristato-bacculatae, ambarinae.

HOLOTYPE: north slope of Volcán Maderas, Ometepe, 800-1000 m s.m., Nicaragua, Neill & Vincelli 3292, MO. ISOTYPE: idem, CR. PARATYPE: Road to Balsa de San Ramón, Alajuela, 900-1000 m s.m., Costa Rica, Stevens 13770 MO; 11 km north of San Ramón, Alajuela, Costa Rica, D.B. Lellinger 749, US, CR.

La nueva especie pertenece a la sección Undulata de Elaphoglossum y sus congéneres más afines son E. boryanum (Fée) Moore, al que se asemeja en las dimensiones de los frondes pero difiere en la densidad y tipo de escamas, y al E. proliferans Maxon & Morton ex Mort., del que difiere por su mayor tamaño. Mickel (Brittonia 37:261-278. 1985) trata las especies prolíferas del género pero no incluye o describe alguna especie referible a la que aquí se describe. La lámina fértil de E. ometepense mide 9-12(15) cm de largo y en su parte más ancha hasta 6.5 cm, es en la base trunca y brevemente decurrente y en el ápice fuertemente contraída para producir, en una mayoría de frondes, una apretada y ganchuda terminación.

Thelypteris darwinii L. D. Gómez sp. nov. subgenus Goniopterididis. Rhizomate breve, erecto, paleis ferrugineis, chartaceis, clathratis deltoideo-lanceolatis, densissime stellato-pilosis, apice obtecto. Frondibus fasciculatis, subdimorphicis, stipitibus fragilissimis, stramineis, pilosissimis, pilis polymorphis, unicellulatis, simplicibus vel apicibus furcatis, stellatis, numerosissimis. Lamina anguste lanceolata, pinnato-pinnatisecta, pinnibus basalibus 4-6-jugatis, liberis. Pinnae curtissime petiolatae, 5-6-lobulatae, venis vis 3-furcatis, basibus apicique rotundatis. Lamina fertiles longe petiolatae, ca. 15 cm, pauciter pinnatae (7-8-paribus). Rache, costa et costulae stellato-puberulis. Receptaculi setosi, sporangia glabra.

HOLOTYPE: above Calcehtok, near Opichen, Yucatán, México, S.Darwin et al. 2144, NO. **ISOTYPE**: CR.

Esta nueva especie es un cercano pariente de Thelypteris asplenoides del cual difiere por la presencia de pelos estrellados en las costas abaxiales, y del Thelypteris bermudiana que presenta superficies laminares pilosas. De ambas especies, la nueva difiere por el subdimorfismo marcado de sus frondes fértiles, lo que lo sitúa en el complejo de Thelypteris reptans pero, contr. s.T. darwinii no apicalmente prolífero. Su presencia en los cenotes, petenes y estratos calcáreos yucatecos es otra prueba de la gran afinidad biogeográfica entre esa Península mexicana y Antillas.

Thelypteris (Goniopteris) peripaeoides L. D. Gómez, sp. nov. Planta herbacea, rheophila, caudice breve, 2-6 cm, erecto, vix 1.5 cm crasso, glabro, dense radicante, stolonifero, stipitibus fasciculatis, 20-25 cm longis, robustis, rigidis, plerumque sulcatis, pilis setosis (0.3 mm) sparse consperso siliisque pilis brevissimis (0.1-0.2 mm) rigidulis, stellatis. Lamina utrinque glabra, eglandulosa, longe deltoideo-lanceolata, 35-40 cm longa, 9-11 cm versus medium lata, ad basim pinnata, ad apicem longissime pinnatifida; pinnibus basalibus abrupte reductis, omnibus sessilibus, alternis, 12-13-jugis, 5-6 cm longis, 1-1.3(1.5) cm latis, ad 1/4 supra costam incisis, segmentis 12-14, oblique-acutis, marginibus integris. Venis utrinque 2-3, simplicibus, basalibus in sinu conniventibus. Indusium setosum, setis rigidis, incrassatis, acutis. Sporangium et receptaculum glabrum. Sporae alato-reticulatae, ambarinae, reniformes, 41-43 X 24.8-27.6 μ m. Indusium nullum.

HOLOTYPE: Río Chiquito, aproximadamente 40 km de Ruta 1 hacia Upala, Alajuela, 800 m. L. D. Gómez & R. Pohl 18622, CR. **PARATYPE**: below cataracts of San Ramón, 3-4 mi. from town, ca. 800 m, in disturbed forest along stream, Alajuela, Costa Rica. T. Croat 46779 MO, CR.

La nueva especie es afín al Thelypteris peripae (Sodiño) Reed descrito de Ecuador del que difiere por su rizoma glabro, las pinnas basales abruptamente reducidas y la pubescencia laminar. La especie ecuatoriana tiene escamas rizomáticas estrellado-pubescentes que se encuentran también en la base de los estípites, las pinnas inferiores se reducen gradualmente y son menos y las superficies laminares son ambas pilosas por pelos adpresos, las venas 3-4 y el receptáculo es setoso. Del complejo de Thelypteris francoana en Centroamérica.

El Volcán Maderas, en la Isla de Ometepe, Nicaragua, parece contener una gran cantidad de especies de helechos cuya distribución se consideraba restringida a Costa Rica o más al sur. Un buen ejemplo de la singular y poco estudiada flora de ese cono volcánico, aislado en el Lago de Nicaragua y ecológicamente situado en el Tropical Seco, es Sticherus retroflexus (Bonner) Copeland, que se suponía endémico de la Cordillera Volcánica Central de Costa Rica, y ahora se registra del Maderas, Nee & Téllez 28080 CR, MO.

Un grupo de helechos driopteroides, muy afín a Stigmatopteris, del género Cyclodium Presl, con una media docena de especies hasta la fecha consideradas como restringidas al Brasil y las Guyanas, extiende su ámbito geográfico hasta Panamá: Cyclodium guianense (Kl.) v.d.Werff ex L.D.Gómez, comb. nov. (Aspidium guianense Kl., Linnaea 20:364. 1847) se encuentra representado en las Provincias de Panamá, Coclé y Veraguas por seis colecciones: W. Lewis et al. 2836; 2279, MO; Sistema 966 MO; Davidse & Hamilton 23534, MO, CR; Knapp 2680 MO, CR; Knapp 5924, MO, CR.

Algunos de los ejemplares panameños son de menores dimensiones y por su hábito general y características de las páleas del rizoma y del estípide, asemejan al Cyclodium varians (Pée) Morton, de Guyana y Trinidad.

Con una migración de norte a sur, se registra la presencia de Danaea crispa Reichb. f., en la Provincia de Coclé, Alto Calvario, 850 m, Panamá, Folsom & Button 3313, MO, CR.

El 1982 fue propuesto Rhynchospora oreoboloidea Gómez-L., para nombrar una pequeña ciperácea, recogida por Arthur Weston, de los páramos costarricenses y con la cual se tipificó una nueva sección de Rhynchospora, sect. Oreoboloides (cf. Phytologia 50(7):459-460. 1982).

Esta misma especie fue obtenida y descrita de Colombia como R. paramoram Mora (cf. Mutisia 29: 4. 1966) lo que convertía al taxon costarricense en sinónimo y hacía necesario designar otro tipo para la mencionada sección (cf. Phytologia 53(6):448. 1983). Sin embargo, el nombre propuesto por Mora para el material colombiano resultó un homónimo posterior de Rhynchospora paramora Steyermark (cf. Fieldiana Bot. 28(1): 44-45. 1951) y por tanto no debe ser empleado. Así, y de conformidad con el Art. 32.4. del Código de Nomenclatura, R. oreoboloidea pude y debe reinterpretarse como nomen novum para el taxon de Mora y mantenerse como especie tipo de la sección Oreoboloides.

El género Lycogalopsis E. Fischer, gasteromicete de la familia Bromeliaceae Zeller, se registra por vez primera para Costa Rica en una colección de la Isla del Caño, Prov. Puntarenas, Rita Alfaro 254 (K). La muestra presenta esporas de fina, densa y diminutamente espinulosas, hasta de $3.04\mu\text{m}$. Dring observa para material africano esporas lisas o débilmente crestadas de $2.5-4\mu\text{m}$, mientras Dennis indica para ejemplares venezolanos y trinitenses esporas finamente verrucosas de $2.5-3\mu\text{m}$. Lycogalopsis solmsii E. Fisch., considerada como la única especie del género, se conoce del África central y occidental, Asia, Indias Orientales, Islas del Pacífico, Antillas y desde Panamá hasta Sur América.-R. Alfaro & L. D. Gómez.

BOOK REVIEWS

Alma L. Moldenke

"THE ARCHAEOLOGY OF BEEKEEPING" by Eva Crane, 360 pp., 270 b/w fig. & photo., 13 tab., 4 maps. Cornell University Press, Ithaca, New York 14850. (1983) 1984. \$39.50.

The highly qualified British author opens her preface with "For more than thirty years my work has been concerned with scientific and technical developments involving bees, beekeeping and hive products, on a world-wide basis". Honey hunting and wax collecting naturally preceded beekeeping which goes back 4,000 years in ancient Egypt, Greece, Crete and Rome; in medieval continental Europe, Britain and Ireland; in ancient Africa and Asia; and in prehistoric America. There are many history-telling photographs, drawings and tables that augment the excellent, interesting text. The main chapters are on prehistoric rock paintings, carvings and paintings in tombs and temples, forest beekeeping, bee boles, shelters and houses, and development of the movable-frame beehive. This book should appeal to readers of many different tastes.

"BIOLOGY OF PLANTS" Fourth Edition, by Peter H. Raven, Ray F. Evert & Susan E. Eichhorn, xvi & 775 pp., hundreds of color & b/w photo. & fig., tab. & maps. Worth Publishers, Inc., New York, N. Y. 10003. 1986. \$39.95.

This new edition continues to be an excellent, richly endowed and updated botany text, ably supplemented by "Laboratory Topics in Botany" and a "Preparators' Guide" by the latter authors. The selection and exposition of topics emphasizes Dr. Raven's guiding outlook on plants, their evolution and economics, their habitats and processes therein based on their gross and micro-structures, and the prospects for the ecological well being of them and of us -- if we get smart enough in time. It is illustrated so copiously and well. Biologically oriented students should be thrilled with all the learning prospects so deftly expounded and illustrated. I hope that non-major students especially will want to keep this fine text after the course has ended. I would love to teach botany with this text -- and, of course, also with plants!

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INTRODUCCION

La familia Loranthaceae esta formada por 30 géneros y aproximadamente 1000 especies distribuidas principalmente en las zonas tropicales del mundo (Rzedowski & Rzedowski, 1979). En México la familia esta representada por ocho géneros y 106 especies (Riba, 1963). Del Valle de México se conocen tres géneros y ocho especies. Además de estas especies se menciona la presencia de Cladocolea loniceroides (van Tieghem) Kuijt, para sitando árboles de Ligustrum en la Ciudad de México, sin embargo se sospecha que se trata de una infestación producida sobre plantas de vivero desarrolladas fuera del Valle de México y posteriormente introducidas a él (Rzedowski & Rzedowski, op cit.).

ANTECEDENTES

La palinología de las Loranthaceae ha sido estudiada por diversos autores, entre ellos Erdtman (1966) describe su polen como (2-) 3 (-4) colpado, colpoidado, sincolpado, peroblato a subprolato; la estratificación de la exina con frecuencia es oscura; de contorno triangular y con la superficie lisa o provista de espinas como en los granos de Arceuthobium y Viscum.

Barth (1972) para Brasil Meridional describe el polen de cuatro géneros y diez especies de lorantáceas, entre las que se encuentran Phoradendron piperoides y P. crassifolium. Las características que menciona para los granos de polen de estas dos especies son las siguientes: tricolporados, de esferoidales a prolotos y con la exina psilada.

Otros autores que han revisado la morfología de los granos de polen de las Loranthaceae son: Heusser (1971), Huang (1972) Markgraf & D'Antoni (1978) y Bonnefille et Riollot (1980).

* Parcialmente apoyado por CONACyT

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Muller (1981) menciona la presencia de polen fósil de lorantáceas en el terciario de varias partes del mundo. En México, Palacios (1985) en su estudio del Mioceno inferior y medio de la región de Pichucalco, Chiapas, encuentra el polen de Aethanthus, Arceuthobium, Psittacanthus y Taxillus.

MATERIALES Y METODOS

Las muestras de polen fueron tomadas de los ejemplares de herbario depositados en el herbario ENCB, principalmente de la colección del Valle de México, cuando no se encontró polen en estos ejemplares fué necesario utilizar otros de sitios fuera del Valle.

El procesamiento de las muestras fué el de Palacios et al. (1985) siguiendo la técnica de Erdtman (1943).

Las especies de los géneros incluídos en este trabajo presentan granos de polen con características muy uniformes por lo que solo se consideró necesario observar al microscopio electrónico de barrido (MEB) una especie representativa de cada uno de los géneros.

Las muestras seleccionadas para ser estudiadas al MEB y fotografiadas no recibieron tratamiento químico, introduciéndose en el sombreador para ser cubiertos con Au, antes de ser observadas en un microscopio marca JEOL, modelo JSM 35.

CLAVE PARA DIFERENCIAR LOS GENEROS DE LA FAMILIA LORANTHACEAE DEL VALLE DE MEXICO

- 1.- Polen heterocolpado, equinado Arceuthobium
- 1.- Polen tricolpado ó tricolporado, psilado a ligeramente escabroso
 - 2.- Tricolpado, colpos que se unen en los polos (sincolpados), oblato Cladocolea
 - 2.- Tricolporado, colpos con terminaciones agudas, prolato Phoradendron

DESCRIPCION E ILUSTRACION DE LOS GRANOS DE POLEN

Arceuthobium abietis-religiosae Heil

Cerro Venacho, al E de Amecameca, Méx. J.
Rzedowski 33890 (ENCB) Lám. I, figs. 1-4

Polen hexacolpado, heterocolpado, tectado, esférico de 23.4 (24.5) 27.3 micras. Vista polar circular, de 20.8 (22.1) 24.7 micras de diámetro. Índice P/E = 1.0. Exina de 1 micra de grosor, con la sexina más gruesa que la nexina, superficialmente al ML se aprecia equinada, espinas de 1.9 (2.7) 3.9 micras de largo por 1.3 micras de base. Tres colpos de 19.5 (21.7) 24.7 micras de largo por 2.2 micras alternan con tres colpos cortos de 9.1 (12.4) 13.0 micras de largo por 2.4 micras. Índice del área polar 0.3, área polar media.

Arceuthobium globosum Hawksworth & Wiens

8 Km al NW de la Presa Iturbide, Iturbide, Méx. J. Rzedowski 27112 (ENCB) Lám. I, figs. 5-8.

Polen hexacolpado, heterocolpado, tectado, subesferoidal de 26.0 (28.3) 33.8 micras por 24.7 (27.2) 30.5 micras. Vista polar circular, de 24.7 (26.4) 27.3 micras de diámetro. Índice P/E = 1.04. Exina de 1.5 micras de grosor, con la sexina más gruesa que la nexina, superficialmente al ML se observa equinada, espinas de 2.6 (3.4) 3.9 micras de largo por 1.3 micras de base. Tres colpos de 22.1 (24.7) 29.9 micras de largo por 2.6 micras alternan con tres colpos cortos de 7.8 (10.6) 13.0 micras de largo por 2.2 micras. Índice del área polar 0.59, área polar grande.

Arceuthobium vaginatum (Willd.) Presl

La Malinche, Tlaxcala. Cibrian et al. 9 (ENCB) Lám. I y III, figs. 9-12 y 31-32.

Polen hexacolpado, heterocolpado, tectado, subesferoidal de 24.7 (26.6) 28.6 micras por 23.4 (25.4) 27.3 micras. Vista polar circular, de 22.1 (23.9) 26.0 micras de diámetro. Índice P/E = 1.04. Exina de 1.5 micras de grosor, con la sexina más gruesa que la nexina, superficialmente tanto al MEB como al ML se observa equinada, espinas de 2.6 (3.6) 3.9 micras de largo por 1.5 micras de base. Tres colpos de 19.5 (21.8) 24.7 micras de largo por 1.8 micras alternan con tres colpos cortos de 7.8 (9.8) 13.0 micras de largo por 3.2 micras. Índice del área polar 0.39, área polar media.

Cladocolea loniceroides (van Tieghem) Kuijt

Calle Nápoles esquina con Marsella, D.F. J. Gimete S/N, 22-II-1971 (ENCB) Lám. II, figs. 13 y 14.

Polen tricolpado, sincolpado, tectado, oblato de 19.5 - (20.5) 23.4 micras por 29.9 (33.7) 35.7 micras. Vista polar angular, de 29.9 (31.9) 34.4 micras. Índice P/E = 0.60. Exina de 1.3 micras de grosor, con la sexina más gruesa que la nexina, superficialmente al ML se observa psilada.

Cladocolea pedicellata Kuijt

Campo de aviación, cerca de Camotla, Chi --
chihualco, Gro. J. Rzedowski 16373 (ENCB)
Láms. II y III, figs. 15-16 y 33-34.

Polen tricolpado, sincolpado, tectado, oblato de 16.9 - - (19.8) 22.1 micras por 32.5 (37.2) 44.2 micras. Vista polar angular, de 28.6 (33.0) 36.4 micras. Índice P/E = 0.53. Exina de 1.8 micras de grosor, con la sexina más gruesa que la nexina, superficialmente al MEB se observa aspera y al ML se observa psilada.

Phoradendron brachystachyum (DC.) Nutt.

Vertiente SE del Cerro Chiluca, Atizapan,
Edo. Méx. E. Mayo 207 (ENCB). Lám. II,
figs. 17-19.

Polen tricolporado, tectado, subesferoidal de 24.7 (29.2) 31.2 micras por 20.8 (23.4) 26.0 micras. Vista polar semi-angular, de 24.7 (26.7) 31.2 micras. Índice P/E = 1.24. Exina de 1.3 micras de grosor, cerca de las aberturas la nexina y la sexina tienen el mismo espesor, hacia los mesocolpos la sexina es más gruesa que la nexina, superficialmente al ML se observa psilada. Colpos de 19.5 (21.2) 22.1 micras de largo por 1.5 micras. Índice del área polar 0.36, área polar media.

Phoradendron galeottii Trel.

3.5 Km al SE de Tezuantla, Epazoyucan, Hgo.
M. Medina 1826 (ENCB) Lám. II, figs.
20-23.

Polen tricolporado, tectado, subesferoidal de 24.0 (28.3) - 31.2 micras por 23.4 (26.5) 29.9 micras. Vista polar semi-angular, de 23.4 (25.9) 27.3 micras. Índice P/E = 1.06. Exina de 1.3 micras de grosor, cerca de las aberturas la nexina y la sexina tienen el mismo espesor, hacia los mesocolpos la sexina es más gruesa que la nexina, superficialmente al ML se observa psilada. Colpos de 19.5 (24.8) 28.6 micras de largo por 1.4 micras. Índice del área polar 0.22, área polar chica.

Phoradendron schumannii Trel.

5 Km al NW de San Jerónimo, Tepeapulco, Hgo.
J. Rzedowski 18284 (ENCB) Lám. II, figs.
24-26.

Polen tricolporado, tectado, subesferoidal de 27.3 (28.8) 27.9 micras por 27.3 (29.9) 31.2 micras. Vista polar semiangular, de 26.0 (28.5) 29.9 micras. Índice P/E = 0.96. - Exina de 1.4 micras de grosor, cerca de las aberturas la nexina y la sexina tienen el mismo espesor, hacia los mesocolpos la sexina es más gruesa que la nexina, superficialmente al ML se observa psilada. Colpos de 24.9 (26.4) 28.6 micras por 2.5 micras. Índice del área polar 0.22, área polar pequeña.

Phoradendron velutinum (DC.) Nutt.

Cañada de Contreras, D.F. E. Matuda 18671
(ENCB) Láms. II y III, figs. 27-30 y 35-36.

Polen tricolporado, tectado, subesferoidal de 24.7 (26.0) 27.9 micras por 26.0 (28.4) 29.9 micras. Vista polar semiangular, de 26.0 (26.3) 27.3 micras. Índice P/E = 0.91. - Exina de 1 micra de grosor, cerca de las aberturas la nexina y la sexina tienen el mismo espesor, hacia los mesocolpos la sexina es más gruesa que la nexina, superficialmente al MEB se observa aspera y al ML se observa psilada. - Colpos de 20.8 (23.0) 24.7 micras por 2.5 micras. Índice del área polar 0.21, área polar pequeña.

DISCUSION Y CONCLUSIONES

Los géneros de la familia Loranthaceae presentes en el Valle de México, tienen granos de polen marcadamente diferentes, lo que permite su fácil diferenciación. Así, el género Arceuthobium presenta polen equinado con colpos largos y delgados que alternan con colpos cortos y amplios. Los granos de polen de Cladocolea son oblatos, sincolpados y con la exina psilada. Por último las microesporas de Phoradendron son tricolporadas y con la exina carente de ornamentación.

Si bien, en la familia la separación a nivel genérico por medios palinológicos es fácil, no así a nivel específico, - pues aún y cuando existen algunas diferencias, estas son tan leves que no permiten la separación de especies.

Las características de los granos de polen de los géneros Arceuthobium y Phoradendron del Valle de México coinciden -- con las observadas por algunos autores en el polen de otras

especies de estos taxa. Por lo que respecta a los granos de Cladocolea no se encontraron descripciones palinológicas de ellos; sin embargo, sus características son acordes con las de la familia.

RESUMEN

En este trabajo se estudiaron al ML los granos de polen de tres géneros y nueve especies de la familia Loranthaceae del Valle de México. Se complementó el estudio con observaciones al MEB del polen de una especie representativa de cada uno de los géneros correspondientes al Valle de México.

Los taxa estudiados son: Arceuthobium abietis-religiosae, A. globosum, A. vaginatum, Cladocolea loniceroides, C. pedicellata, Phoradendron brachystachyum, P. galeottii, P. schumannii y P. velutinum.

Los granos de polen de esta familia a nivel genérico son marcadamente diferentes en cuanto a aberturas, ornamentación y forma se refiere, a nivel específico se encontraron pocas diferencias.

SUMMARY

In this paper is studied at LM pollen grains of three genus and nine species of the family Loranthaceae for Valle de México. This study was completed with observations at SEM of pollen grains of a representative specie each genus.

The taxa studied are: Arceuthobium abietis-religiosae, -- A. globosum, A. vaginatum, Cladocolea loniceroides, C. pedicellata, Phoradendron brachystachyum, P. galeottii, P. schumannii y P. velutinum.

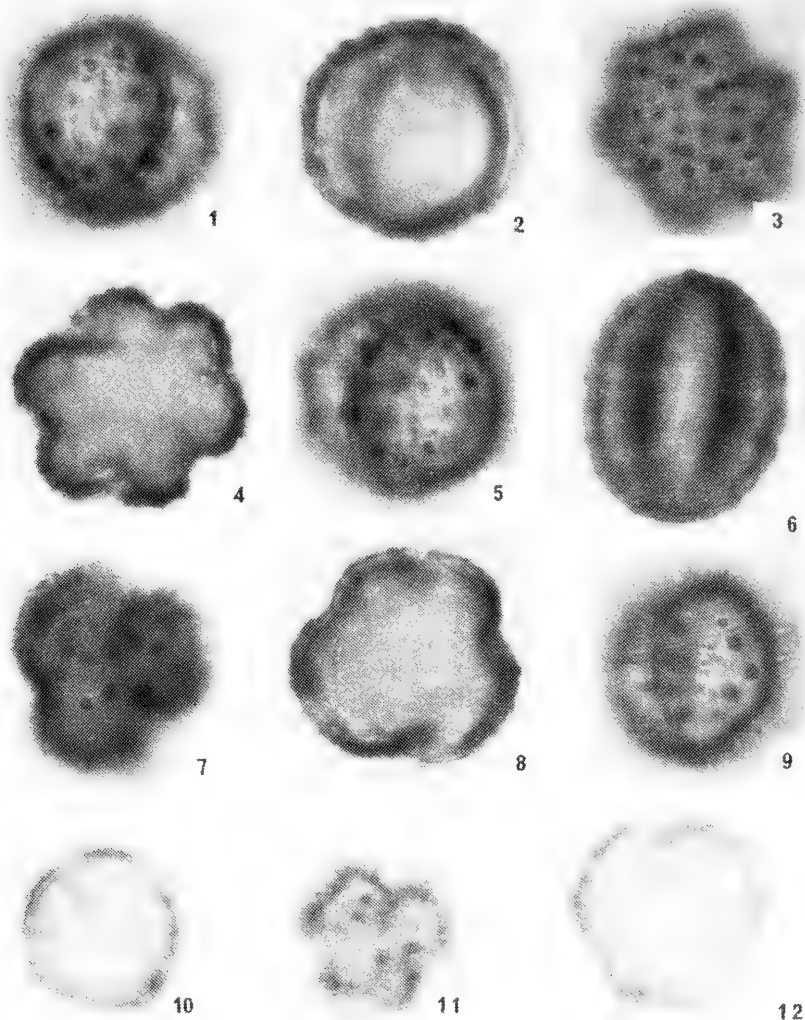
Pollen grains belonging this family to level generic show great differences, taking into consideration characteristics such as: apertures, ornamentation and shape. There are few differences in the pollen grains among species of this family.

AGRADECIMIENTOS

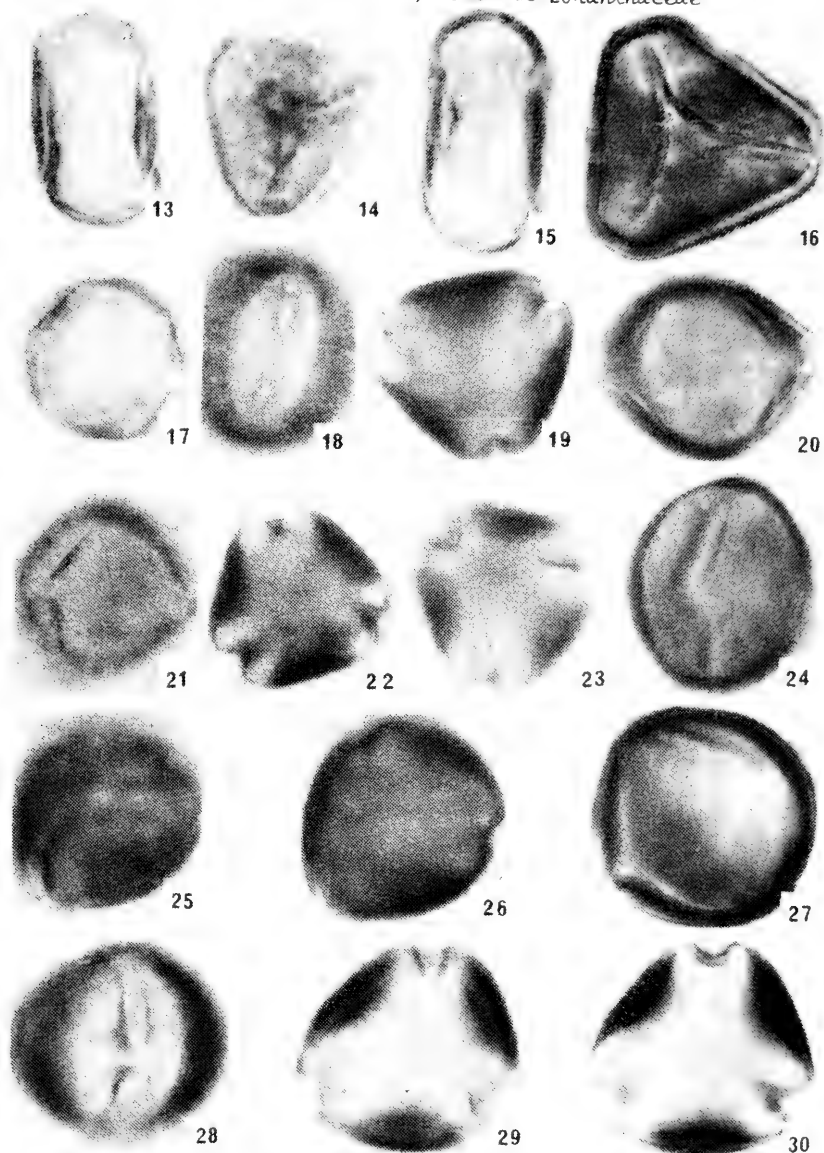
Deseamos expresar nuestro agradecimiento a la Bióloga Yo - landa Hornelas del Instituto de Ciencias del Mar y Limnología de la Universidad Nacional Autónoma de México, por el -- trabajo realizado con el microscopio electrónico de barrido. A la Sra. Rita Hernández Ch. por el trabajo mecanográfico.

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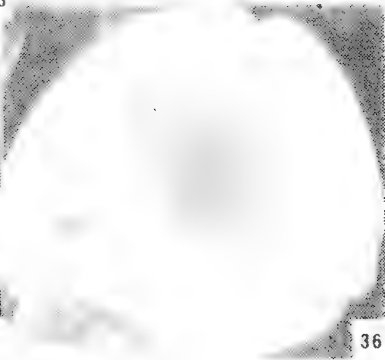
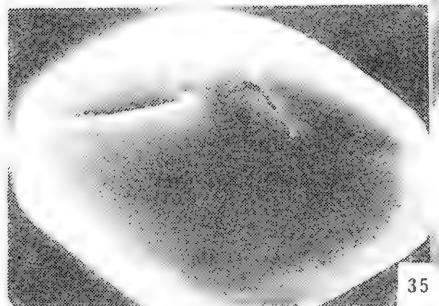
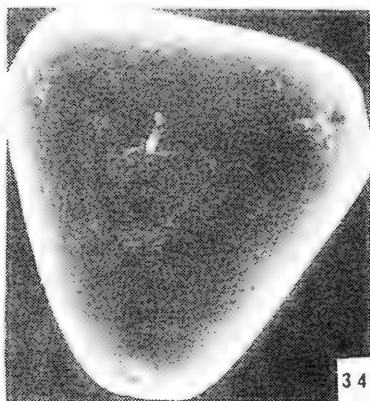
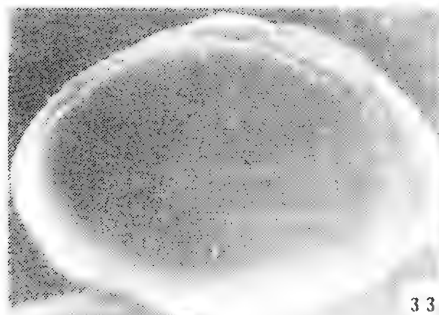
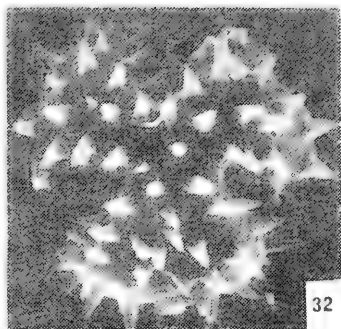
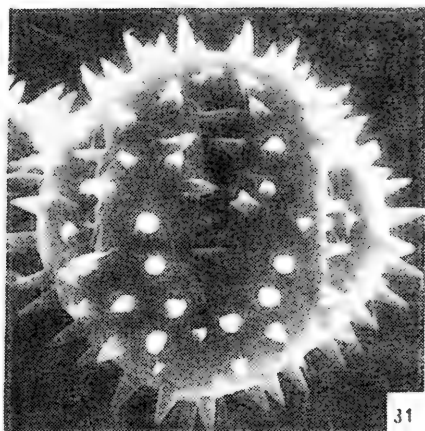
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LAMINA I. Todas las observaciones X 1000. Arceuthobium abietis-religiosae 1) Vista ecuatorial superficial. 2) Sección óptica. 3) Vista polar superficial. 4) Sección óptica A. globosum. - 5) Vista ecuatorial superficial. 6) Sección óptica. 7) Vista polar superficial. 8) Sección óptica A. vaginatum. 9) Vista - polar superficial. 10) Sección óptica. 11) Vista polar superficial. 12) Sección óptica.



LAMINA II. Todas las observaciones X 1000. *Cladocoelea lonice-roides*. 13) Sección óptica. 14) Vista polar superficial. *C. pedicellata*. 15) Sección óptica. 16) Vista polar superficial. *Phoradendron brachystachyum*. 17) Sección óptica. 18) Vista ecuatorial superficial. 19) Vista polar superficial. *P. galeottii*. 20) Sección óptica. 21) Vista ecuatorial superficial. 22) Sección óptica. 23) Vista polar superficial. *P. schumannii*. 24) Vista ecuatorial superficial. 25) Vista polar superficial. 26) Sección óptica. *P. velutinum*. 27) Sección óptica. 28) Vista ecuatorial. 29) Vista polar superficial.



LAMINA III. Observaciones al MEB. Arceuthobium vaginatum, 31) Vista superficial mostrando las aberturas X 3200. 32) Vista polar X 2600. Cladocolea pedicellata. 33) Vista ecuatorial superficial X 2600. 34) Vista polar X 2400. Phoradendron velutinum. 35) Vista ecuatorial mostrando uno de los colpos X 3000. 36) Vista polar X 3600.

MORFOLOGIA DE LOS GRANOS DE POLLEN DE LOS GENEROS Y ESPECIES DE
LA FAMILIA CAPPARIDACEAE DEL VALLE DE MEXICO. No. 5

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INTRODUCCION

La familia Capparidaceae comprende cerca de 40 géneros con 500 especies (Rzedowski y Rzedowski; 1979) generalmente de climas tropicales de América y Africa, muchas de ellas xerófitas, sus miembros están formados por pequeños árboles o arbustos, -- ocasionalmente lianas y raramente herbáceas.

En el Valle de México solamente existen tres especies, las cuales son herbáceas: Cleome multicaulis, Cleomella mexicana y Polanisia uniglandulosa.

ANTECEDENTES

Entre los autores que han estudiado la morfología de los granos de polén de la familia Capparidaceae se encuentra a --- Erdtman (1966); entre los géneros aquí estudiados solo menciona a los de Cleome espinosa, provistos con pequeñas espinulas. -- Erdtman (1969) considera a esta familia marcadamente estenopalínológica. Heusser (1971) describe el polen de Cleome chilensis como monada, isopolar radiosimétrica, tricolporoidado, colpos -- largos engrosados, con poros mal definidos, subprolato, con el contorno circular, exina tectada de 1 micra de grosor, microe--quinada, con dimensiones de 20-22 micras x 16-17 micras. Huang (1972) entre otros géneros, describe el polen de Polanisia icosandra, como tricolporado, subprolato a prolato esferoidal de 21-30 x 18-25 micras, apertura vestibulada, transversalmente -- elíptica, sexina granulosa con el patrón L/O. La asociación de palinólogos de la lengua francesa (1974) en sus estudios al ML y MEB incluyen las microsporas de Cleome parvipetala, con las -- siguientes características: polen isopolar, tricolporado, elíptico en vista ecuatorial y trilobado en vista polar colpos bien definidos y con membranas lisas, poro subcircular; exina finamente reticulada. En las observaciones con el MEB, el tectum aparentemente se observa con el mismo tipo de ornamentación; -- las medidas para el polen de esta especie fluctúan entre 24 micras (23 a 27 micras) X 16 micras (15 a 17 micras).

Markgraf y D'Antoni (1978) describen el polen de otros géneros, de la familia Capparidaceae los cuales no se encuentran en el Valle de México.

Polen fósil de esta familia sólo ha sido encontrado el de Cleome por Palacios (1985) en sedimentos del Mioceno Inferior del norte de Chiapas.

MATERIAL Y METODOS

Las preparaciones donde se observaron los granos de polen al ML fueron tratadas con la técnica de acetólisis (1943) levemente modificada y las fotografías al MEB fueron tomadas en un microscopio JEOL-JCM-JX35 de la Escuela Superior de Ingeniería Química e Industrias Extractivas (ESIQUE) del Instituto Politécnico Nacional, las impregnaciones se realizaron con Ag.

CLAVE PARA LA SEPARACION DE GENEROS Y ESPECIES DE LA FAMILIA - CAPPARIDACEAE DEL VALLE DE MEXICO.

- 1.- Polen con ornamentación reticulada y poros ⁺ circulares de 4 micras de diámetro.....Cleome multicaulis
- 1.- Polen con ornamentación estriada-reticulada, poros circulares o elípticos.
 - 2.- Polen subprolato, colpos con las membranas granulosas y poros elípticos de 6 X 4 micras.....Cleome mexicana.
 - 2.- Polen prolato, estriado-reticular fácilmente observable con ML, tectum con microperforaciones, que solamente se apreciaban al MEB. Poros circulares de 2.5 micras de diámetro, cubiertos con una membrana escabrosa.....Polanisia uniglandulosa.

DESCRIPCION DE LOS GRANOS DE POLEN DE LOS GENEROS DE LA FAMILIA CAPPARIDACEAE DEL VALLE DE MEXICO.

Cleome multicaulis Moc. et Sessé

Totolcingo, Méx.
Rzedowski 30456 (ENCB)
Lams. I y II
Figs. 1-5, 15 y 17

Polen tricolporado, tectado, prolato de 24 (20.7) 28.6 X 18 (15.9) 23.4 micras. Vista polar circular, con diámetro de 18 -- (15.9) 23.4 micras Índice P/E = 1.3. Exina de 2.6 micras de grosor con la sexina ligeramente más gruesa que la nexina superficialmente al MEB la ornamentación se observa estriada y al ML la ornamentación es reticulada. Colpos de 16.9 (15) 23.4 micras de largo X 2 micras. Poros + circulares, generalmente de 4 micras de diámetro. Índice del área polar 0.4, área polar media.

Cleomella mexicana Moc. et Sessé

Totalco, Ver.

Rzedowski 32931 (ENCB)

Lams. I y II

Figs. 6-9, 16 y 18

Polen tricolporado, tectado, subprolato de 18(21.4) 27.3 X 14(17) 19.5 micras. Vista polar circular, de 1.5 micras de grosor, con la sexina ligeramente de menor espesor que la nexina, superficialmente al MEB se observa con la ornamentación estriada y con el ML levemente estriada-reticulada. Colpos de 15(17) 18.6 micras de largo por 2 micras, con las terminaciones agudas y al MEB las membranas se observan escabrosas. Poros transversalmente elípticos de 6 X 4 micras. Índice del área polar = 0.2, área polar pequeña.

Polanisia uniglandulosa Cav.

Pedregal de San Angel, D.F.

Hernández 25 (ENCB)

Lams. I y II

Figs. 10-14 y 19-21

Polen tricolporado, tectado, prolato de 23(26) 28.6 X 15 (19.7) 23.4 micras. Vista polar circular, de 19.5 (16.6) 23.4 micras de diámetro. Índice P/E = 1.33. Exina de 2 micras de grosor, con la sexina de igual espesor que la nexina, superficialmente al MEB se observa estriada-perforada y al ML se aprecia estriado-reticulada. Colpos de 20(22.8) 24.7 micras de largo X 2.5 micras. Poros circulares de 2.5 micras de diámetro, cubiertos con una membrana escabrosa. Índice del área polar = 0.2 área polar pequeña.

DISCUSION Y CONCLUSIONES

Según Erdtman (1969) esta familia es estenopalinológica, sin embargo con los resultados aquí obtenidos fué posible separar los taxa del Valle de México.

Las diferencias palinológicas que se tomarón en consideración fueron las características de las aberturas y la ornamentación, en Cleome multicaulis, su polen es observado al ML claramente reticular y con poros circulares, en Cleomella mexicana se pudo apreciar levemente estriado-reticulada y con poros transversalmente elípticos, en cambio en Polanisia uniglandulosa se observa con mayor claridad estriado-reticular aunque al MEB se observan otros tipos de ornamentación. En Cleome multicaulis y Cleomella mexicana es estriada y Polanisia uniglandulosa estriada-perforada, esto último separa a este taxa por completo de los otros géneros y especies.

Asimismo, en Cleomella mexicana se observó que las membranas de los colpos son escabrosos y en Cleome multicaulis son lisas.

En la literatura consultada, se han reportado especies de Cleome que tienen polen con la ornamentación equinada, en cambio la del Valle de México es reticulada.

Probablemente, esto se deba a que dentro de las especies americanas de Cleome existen ocho secciones; siete de ellas con las hojas multifolioladas y una con hojas simples y quizás las diferencias en la morfología polínica puedan corresponder a las divisiones taxonómicas del género.

RESUMEN

En este trabajo se estudio al MEB y al ML el polen de tres taxa de la familia Capparidaceae del Valle de México, Cleome multicaulis, Cleomella mexicana y Polanisia uniglandulosa.

Los granos de polen de las tres especies muestran diferencias entre sí, por lo mismo pudieron ser separadas tomando en consideración las características de ornamentación, aberturas y forma.

SUMMARY

In this paper is studied at SEM and LM pollen grains of three taxa belonging to family Capparidaceae from Valle de México, Cleome multicaulis, Cleomella mexicana and Polanisia uniglandulosa.

Pollen grains of the three species show differences, therefore could be separated taking into consideration characteristics of the ornamentation, apertures and shape.

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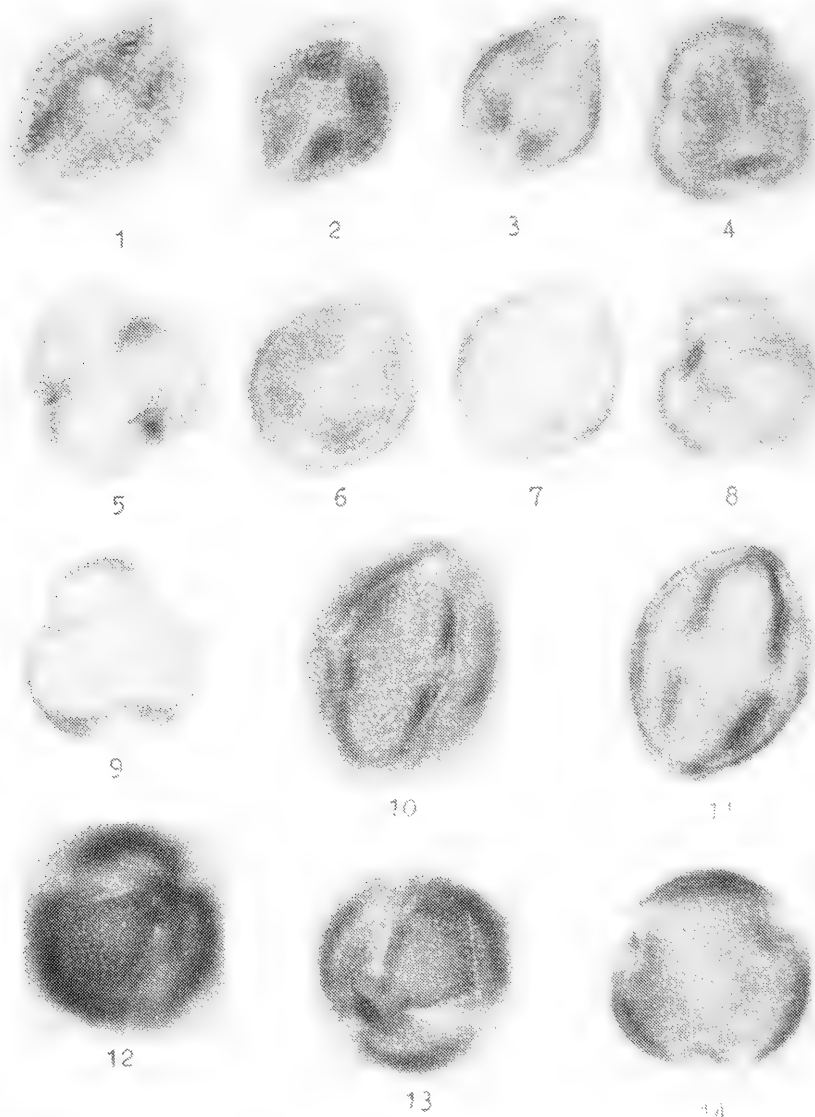
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México. Tesis Doctoral, Escuela Nacional de Ciencias Biológicas. del I.P.N. pag. 26

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Los autores agradecen al Dr. Gerardo Cabañas y al --
Ing. Jorge Esteban Araujo de la Escuela Superior de Ingeniería
Química e Industrias Extractivas (ESIQUE) División de Inge---
niería Metalúrgica, por permitirnos el uso del microscopio --
electrónico de barrido.



Cleome multicaulis: 1) Vista ecuatorial superficial, 2) Aberturas
 3) Corte óptico, 4) Vista polar superficial 5) Corte óptico *Cleome-*
lla mexicana, 6) Vista ecuatorial superficial, 7) Corte óptico. ---
 8) Vista polar superficial. 9) Corte óptico. *Polanisia uniglandulo-*
sa 10) Vista ecuatorial superficial, 11) Corte óptico. 12 y 13 ---
 Vistas polares superficiales. 14) Corte óptico.
 Todas son X 1000.



15



16

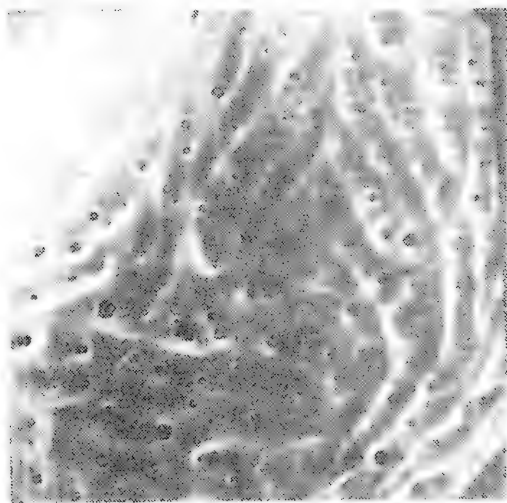


17



18

Observaciones al MEB. *Cleome multicaulis*. 15) Ornamentación X 2300
 17) acercamiento óptico a la altura de las aberturas X 3200 *Cleome-
 illa mexicana*. 16) Ornamentación y colpos con membranas granulosas -
 X 2300 18) Acercamiento óptico a la altura del ecuador X 3200.



Observaciones al MEB

Polarisia uniglandulosa 19) Vista polar mostrando la ornamentación X 4000, 20) Vista ecuatorial superficial X 3200, 21) Acercamiento óptico mostrando perforaciones en el tectum X 10000,

MORFOLOGÍA DE LOS GRANOS DE POLLEN DEL GÉNERO CASIMIROA
(RUTACEAE) DEL VALLE DE MÉXICO. No. 4. *

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INTRODUCCION

La familia Rutaceae incluye aproximadamente 140 géneros y - 1300 especies de amplia distribución mundial, en México 20 géneros y más de 60 especies, varias de estas especies importantes desde el punto de vista económico por la gran cantidad de ácido cítrico que contienen. Para el Valle de México se reporta Casimiroa edulis.

El género Casimiroa en México y Centroamérica está representado por 6 especies, 2 variedades y 6 formas, las únicas especies que son objeto de cultivo o semicultivo por sus frutos -- grandes y comestibles son la Casimiroa edulis y varias formas de Casimiroa sapota; las demás son silvestres.

ANTECEDENTES

Al revisar la bibliografía tendiente a reunir información sobre la morfología polínica de Casimiroa, se encuentra que el -- polen de éste género ha sido poco estudiado. Palacios (1966) -- describe el polen de C. sapota y es el único dato obtenido.

MATERIAL Y METODOS

Parte de las muestras de polen fueron tratadas con la técnica de acetólisis Erdtman (1943) levemente modificada para el ML y la otra parte sin tratamiento químico se utilizaron para el MEB y se sombrearon con Ag para observarlos en un microscopio JEOL-JCM-JX35 de la Escuela Superior de Ingeniería Química e Industrias Extractivas (ESIQUE) del Instituto Politécnico Nacional.

Las muestras de polen fueron tomadas de un ejemplar de San -- Luis Potosí, porque las muestras del Valle de México no presentan flores, solo frutos.

* Trabajo parcialmente subsidiado por el Consejo Nacional de -- Ciencia y Tecnología, México.

** Becarios de COFAA del I.P.N.

DESCRIPCION E ILUSTRACION DE LOS GRANOS DE POLEN.

Casimiroa edulis Llave & Lex.

2 Km al SE de San Nicolás
 San Luis Potosí, J. Rzedowski
 12240, 25-1-1960 (ENCB)

Lámina 1. Figs. 1, 2, 3, 4, 5, 6, 7, 8 y 9

Polen tricolporado, tectado, oblato esferoidal de 17(23.5) - 29 micras por 22 (24.5) 28 micras, índice P/E = 0.95. Vista polar circular a semicircular de 23(25.5) 30 micras por 17(21) 26 micras. Exina de 1.5 a 2.5 micras de grosor, sexina de 1 a 1.5 micras con la superficie estriada, nexina de 0.5 a 1 micra de grosor, surcos de 17 a 22 micras de largo por + 1.5 a 2 micras de fisura con terminaciones agudas. Surcos transversales de 5 a 6 micras de grosor por 2 a 3 micras de fisura, con terminaciones redondeadas y situadas en el centro de los colpos. Índice del área polar 0.51, grande. Al ML y al MEB no se encontraron diferencias.

DISCUSION Y CONCLUSIONES

Al revisar la bibliografía sobre el género Casimiroa, encontramos que existen problemas para diferenciar taxonómicamente C. edulis y C. sapota, pero esta última tiene su área de distribución en lugares de clima caliente y presenta las hojuelas anchamente elípticas ovales u obovadas y C. edulis presenta las hojuelas lanceoladas, largamente elípticas acuminadas y su área de distribución incluye lugares de clima templado.

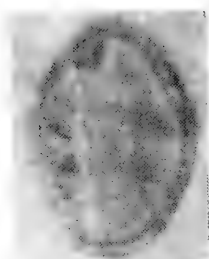
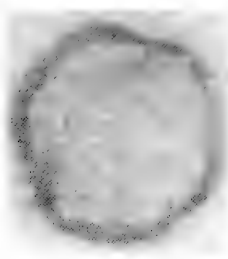
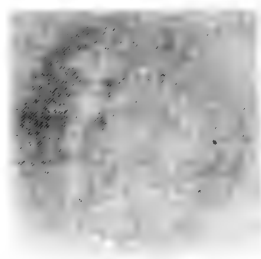
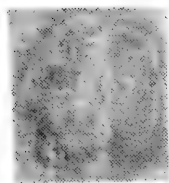
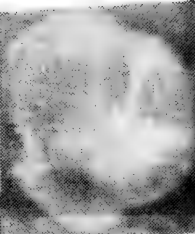
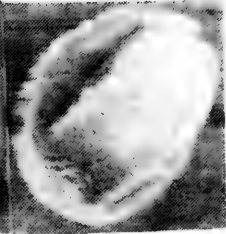
Se estudio el polen de C. sapota, pues se penso que quizás a nivel de la morfología polínica podriamos encontrar diferencias entre las dos especies, pero después de las observaciones realizadas y comparandolas con las de Palacios (1966), no encontramos diferencias en el polen de ambas especies.

RESUMEN

Se estudian los granos de polen de Casimiroa edulis (Rutaceae) que se encuentra en el Valle de México, las cuales resultaron ser tricolporado con ornamentación estriada.

SUMMARY

In this paper are studied pollen grains of Casimiroa edulis (Rutaceae) from Valle de México, which are tricolporate, and the ornamentation is striate.

**1****2****3****4****5****6****7****8****9**

AGRADECIMIENTOS

Los autores agradecen al Dr. Gerardo Cabañas y al Ing. Jorge Esteban Araujo de la Escuela Superior de Ingeniería Química e Industrias Extractivas (ESIQUIE), División de Ingeniería Metalúrgica, por permitirnos el uso del microscopio electrónico de barrido.

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Casimiroa edulis (M.L.).

- 1.- Vista ecuatorial mostrando la exina X 1000
- 2.- Vista polar mostrando la exina X 1000
- 3.- Vista ecuatorial mostrando el colpo longitudinal y transversal X 1000
- 4.- Vista superficial mostrando la ornamentación X 1000
- 5.- *C. edulis* (MEB). Vista ecuatorial X 2300
- 6.- Vista polar X 2300
- 7.- Vista ecuatorial mostrando los colpos y la ornamentación X 2300
- 8 y 9.- Detalle de la ornamentación X 2300.

MORFOLOGIA DE LOS GRANOS DE POLEN DEL GENERO KALLSTROEMIA
(ZYGOPHYLLACEAE) DEL VALLE DE MEXICO. No. 3,*

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INTRODUCCION

La familia Zygophyllaceae incluye aproximadamente 27 géneros y cerca de 200 especies de distribución pantropical, extendiéndose dentro de regiones templadas de los Hemisferios Norte y -- Sur.

En México 8 géneros y cerca de 40 especies. En el Valle de México 1 género y 2 especies.

ANTECEDENTES

La familia Zygophyllaceae ha sido dividida por algunos autores como Engler (1931) en 7 subfamilias y estas a su vez en tribus y subtribus; Erdtman (1966) estudió los granos de polen de 21 géneros y 36 especies de las diferentes subfamilias, tribus y subtribus de la familia Zygophyllaceae, correspondiendo en -- términos generales la morfología polínica a las divisiones de -- las diferentes categorías taxonómicas de la familia, así tam-- bién menciona que los granos de polen se la Subfamilia Peganoideae y Tetradiclidoideae tienen características en común con las Rutaceae; algunos géneros de la Subfamilia Zygophylloideae como Sisyndite sus granos de polen son similares a Linaceae-Linoi-- deae, mientras que en la Subtribu Tribulinae de la subfamilia -- anteriormente citada son más o menos similares con algunos taxa de Polemoniaceae. Los granos de polen de la Subfamilia Balamtoideae tienen caracteres en común con algunas Simarubaceae.

El género Kallstroemia, único género representado en el Valle de México, pertenece a la Subfamilia Zygophylloideae. Tribu Tribuleae, Subtribu Tribulinae y forma un grupo natural morfológica y palinológicamente con los géneros Kelleronia, Tribulus y Tribulopsis.

El género Kallstroemia está representado por unas 17 especies nativas del Nuevo Mundo y la distribución geográfica del -- género en Norteamérica sugiere que su origen probablemente sea México, por ser su centro de diversidad y abundancia, sin embargo, esto no se comprueba pues no se encuentra en el registro -- fósil. (Porter, 1969).

* Trabajo parcialmente subsidiado por el Consejo Nacional de -- Ciencia y Tecnología, México.

** Becarios de COFAA del I.P.N.

MATERIAL Y METODOS

Las muestras de polen se dividieron en dos grupos; uno de ellos se acetalizó con la técnica de Erdtman (1943) levemente modificada y estas se observaron al microscopio de luz (ML).

Las otras muestras sin tratamiento químico, se utilizaron para el microscopio electrónico de barrido (MEB) y se sombrearon con Au para observarlas en un microscopio JEOL-JSM 35.

Las muestras de Kallstroemia parviflora fueron tomadas de un ejemplar del Estado de Morelos porque los del Valle de México presentan poco polen.

DESCRIPCION E ILUSTRACION DE LOS GRANOS DE POLEN

Kallstroemia parviflora Norton

Puente de Ixtla, Morelos
M.Medina 2021, 21-IX-1977
(ENCB)

Figs. 1 y 2.

Polen periporado, tectado, esferoidad de 52.4(54.3) 57.5 micras por 52.4(53.7) 55 micras, índice P/E = 1.01. Exina de 6 a 7 micras de grosor, sexina de 4 a 5 micras con la superficie reticular (carinimurado), muros ligeramente ondulados, nexina de 2 micras. Poros alrededor de 25, de 4 a 4.5 micras de diámetro, al ML y MEB no se encontraron diferencias.

Kallstroemia rosei Rydb.

Cerro de Zacatenco, V.G.A.Madero
D.F. M.L.Arreguín 410. VIII.1972
(ENCB)

Figs. 3,4 y 5.

Polen periporado, tectado, esferoidad de 50.7(54.9) 57.5 micras por 50.7(55.4) 58.3 micras; índice P/E = 0.99, Exina de 5 a 6 micras de grosor, sexina de 4 a 5 micras de grosor con la superficie reticular (carinimurado), muros ondulados, nexina de 1 a 2 micras. Poros alrededor de 25, de 3.3 a 4.2 micras de diámetro. Al ML y MEB no se observan diferencias.

DISCUSION Y CONCLUSIONES

La morfología polínica del género Kallstroemia es muy uniforme y no es posible a nivel del polen diferenciar K.rosei y K.parviflora

RESUMEN

En este trabajo se estudian los granos de polen de dos espe-

cies del género *Kallstroemia* (Zygophyllaceae) que se encuentran en el Valle de México (*K. parviflora* y *K. rosei*), los cuales resultaron periporados, reticulados y esferoidales. El polen de ambas especies es muy semejante, por lo que no es posible separar las especies.

SUMMARY

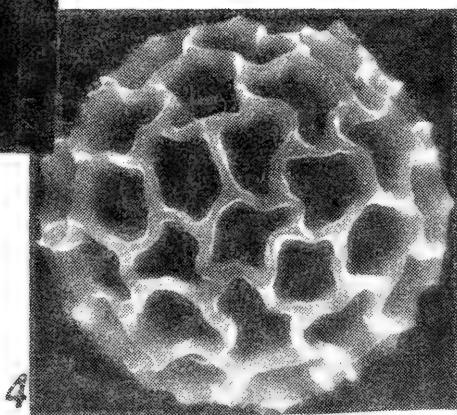
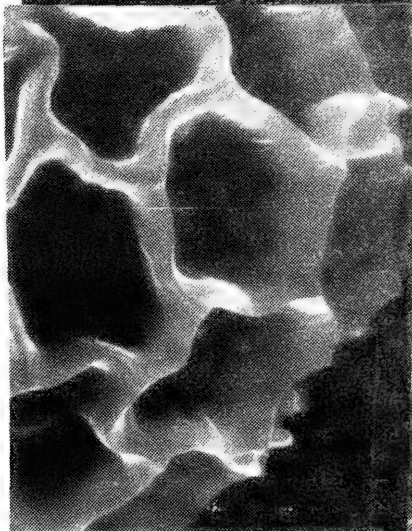
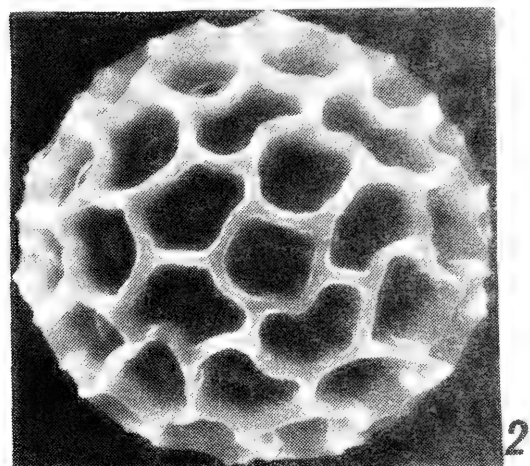
In this paper are studied pollen grains of *Kallstroemia* (Zygophyllaceae) from Valle de México (*K. parviflora* and *K. rosei*) which are periporate, reticulate and spheroidals. Few differences there are in pollen grains of both species and is not possible the separation.

AGRADECIMIENTOS

Deseamos expresar nuestro agradecimiento a la Bióloga Yolanda Hornelas Orozco del Instituto de Ciencias del Mar y Limnología de la Universidad Nacional Autónoma de México, el haber procesado y tomado las fotografías de las muestras de polen al MEB.

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Kallstroemia parviflora 1.- vista general (ML) x 400; 2.- vista general (MEB) x 1500. *K.rosei* 3.- vista general (ML) x 400; -- 4.- vista general (MEB) x 1300; 5.- Detalle del reticulo y poros (MEB) x 3000.

UNA NUEVA LOCALIDAD PARA NORTEAMERICA DE PHYLLITIS
SCOLOPENDRIUM (L.) NEWM. VAR. AMERICANA FERNALD. *

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Al estudiar la pteridoflora del Estado de Nuevo León, México, la Biol. Susana Favela colectó un ejemplar en el municipio de -- Zaragoza que inicialmente se había identificado como Phyllitis scolopendrium (L.) Neum., sin embargo, dicha identificación se -- tomó con cierta reserva, pues esta especie era citada para Europa, Japón, Canadá y Estados Unidos.

Al revisar la bibliografía para tratar de esclarecer cuál era el nombre correcto de nuestra planta, encontramos para empezar, que algunos autores no reconocen como género válido a Phyllitis debido a que se cruza fácilmente experimental y naturalmente con Ceterach, Asplenium y algunos otros géneros; por lo anterior, -- Phyllitis carece de una barrera de cruce requerido para un género natural y por esto prefieren mantener a las plantas aquí -- incluidas dentro del género Asplenium.

Los autores que están por mantenerlo como un género distinto a Asplenium se basan fundamentalmente en que los números cromosómicos de las especies de P. scolopendrium str. son más bajos que los números cromosómicos de Asplenium, además de la conveniencia de tratar un taxa como un género separado que como un -- subgénero o sección de un género grande.

En cuanto al número de especies de Phyllitis, Love & Love -- (1973) reconocen 4 especies, P. sagittata en la región del Mediterráneo, Guinea y Heywood. P. hybrida está restringida a unas pocas islas cerca de las Costas de Istria en Yugoslavia en el noreste de Mar Adriático. P. lindenii del sureste de México y P. scolopendrium distribuido desde Europa occidental a Siberia y un taxon ligeramente distintos en el noreste de América.

*Trabajo parcialmente subsidiado por el Consejo Nacional de -- Ciencia y Tecnología. PCECBNA-030184 y la Dirección de Graduados e Investigación del Instituto Politécnico Nacional 862312.

Fernald (1935) realizó un exámen profundo entre las plantas europeas y americanas de Phyllitis scolopendrium (L.) Neum. y las consideró como dos variedades, citando como diferencias.

P. scolopendrium var. americana P. scolopendrium var. scolopendrium

- | | |
|---|--|
| - Plantas en general más grandes (9-60 cm). | - Plantas más pequeñas (11-34 cm) |
| - Escamas del peciolo lineares filiformes, largo caudadas | - Escamas del peciolo lanceolados a linear-atenuados |
| - Soros ocupan + el 54 % de la lámina | - Soros ocupan del 33 al 100 % de la lámina |
| - Largo del indusio 0.3 a - 2.2 cm. | - Largo del indusio 0.7 a 3.3 cm. |
| - Puntas de las venas delgadas y terminando lejos del margen. | - Puntas de las venas elípticas y terminando cerca del margen. |

Además de las diferencias citadas por Fernald (op. cit.), al estudiar las esporas, encontramos las siguientes

- | | |
|---|--|
| -Perina formando pocas crestas, a lo más 7 por espora | -Perina formando muchas crestas más de 10 por espora |
| -Crestas de la perina redondeadas a anchamente cónicas. | -Crestas de la perina mamilares a estrechamente cónicas. |

Al examinar nuestra planta llegamos a la conclusión de que se trataba de P. scolopendrium var. americana, aunque la distribución conocida para este taxa era New Brunswick, Ontario, Nueva York y Tennessee, por lo que el hallazgo de esta planta en Nuevo León es el límite más al sur que se conoce de esta variedad y es un nuevo registro para México, ya que de este género sólo se conocía Phyllitis lindenii (Hook.) Maxon del sureste de México y Haití. Aunque P. lindenii y P. scolopendrium se trata de taxa muy cercanos, se diferencian en que el primero presenta el peciolo y el raquis más pubescentes y las hojas menos prominentes cordadas en la base.

Phyllitis scolopendrium var. americana, fué colectada en La Encantada, mpio. de Zaragoza, Nuevo León, 8-III-1983, bosque de Pinus-Quercus, S. Favela 217, planta terrestre. (ENCB, UNL).

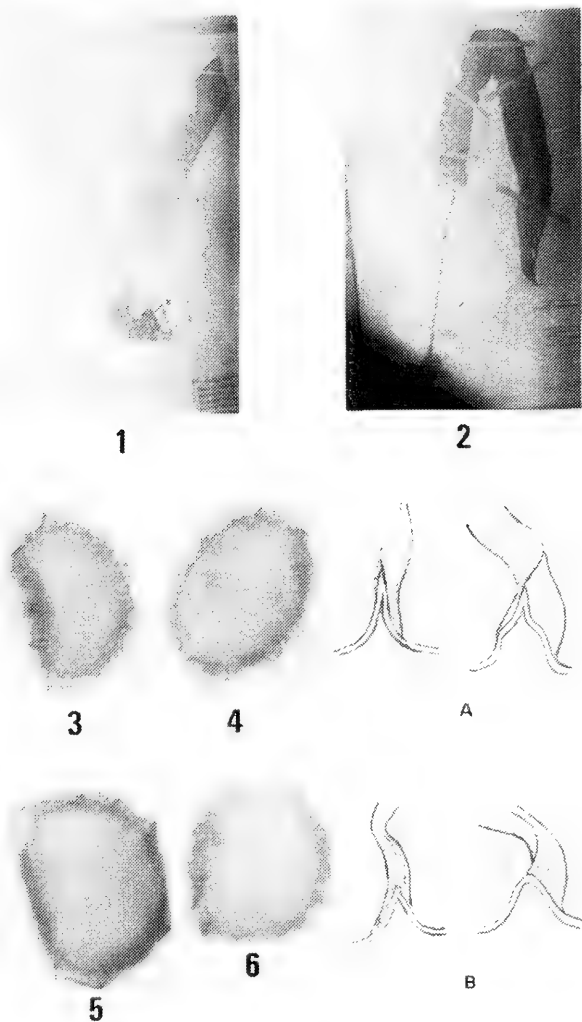


. Distribución conocida de
Phyllitis scolopendrium var.
americana

x Distribución conocida de
P. lindenii

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- 1) *Phyllitis scolopendrium* var. *scolopendrium*, aspecto general;
 - 2) *P. scolopendrium* var. *americana*, aspecto general;
 - 3) *P. scolopendrium* var. *scolopendrium*, espóra, vista lateral X 1000;
 - 4) espóra, vista proximal superficial X 1000;
 - 5) *P. scolopendrium* var. *americana*, espóra vista lateral X 1000;
 - 6) espóra vista superficial X 1000.
- A.- esquema donde se muestran pliegues de la perina cónicos estrechos y mamilares.
- B.- esquema donde se muestran pliegues de la perina cónicos y anchamente cónicos.

RESUMEN

Phyllitis scolopendrium (L.) Neum. var. *americana* Fernald
Se cita por primera vez para Nuevo León, México, sólo se cono-
cía de New Brunswick, Ontario, New York y Tennessee.

SUMMARY

Phyllitis scolopendrium (L.) Neum. var. *americana* Fernald
Is cited for the first time from Nuevo León, México, the --
world-range was New Brunswick, Ontario, New York and Tennessee.

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Los autores agradecen al Dr. Alfonso Delgado del Instituto
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"RESULTADOS PRELIMINARES DEL ESTUDIO FLORISTICO DEL FITOPLANCTON
DE LA PARTE NORTE DEL GOLFO DE CALIFORNIA, MEXICO"

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INTRODUCCION: Los estudios del fitoplancton marino en el Golfo - de California son muy limitados, pese a la importancia de éste - en la productividad primaria. Conscientes de la necesidad de rea-
lizar estudios en este campo de trabajo, algunos investigadores
del Laboratorio de Ficología de la Escuela Nacional de Ciencias
Biológicas, nos interesó conocer la flora de la parte norte del
Golfo de California.

OBJETIVOS: El objetivo de este trabajo es la divulgación de los
resultados obtenidos de este estudio y promover el interés en es-
te campo para continuar analizando el plancton, por lo que de -
ninguna manera se pretende hacer interpretaciones de la ecología
del plancton, la cual exige periodos más amplios que permitan -
comprobar los variados fenómenos que ellos implica.

ANTECEDENTES: Los elementos fitoplanctónicos más representativos
en los océanos pertenecen a las clases Bacillariophyceae y Dino-
phyceae, estos dos grupos de algas han sido estudiados en otros
países desde diferentes puntos de vista: sistemáticos, morfoló-
gico, ecológico, de productividad primaria, etc.

En México pocos han sido los estudios realizados en este campo
por autores nacionales.

Para el Golfo de California entre los principales autores que
pueden citarse están: Allen (1937) que trabajó acerca de la dis-
tribución de las diatomeas y en general de especies fitoplanctó-
nicas; Cupp y Allen (1938) se refirieron a la distribución y --
abundancia de las diatomeas; Osorio Taffal (1942) se refirió a
la descripción de algunos dinoflagelados; Gilbert y Allen (1943)
hicieron otra contribución al conocimiento del fitoplancton de -
la región; Osorio Taffal (1943) estudió el Mar de Cortés y la -
productividad de sus aguas; Barreiro (1967) hizo una contribu-
ción al conocimiento de los dinoflagelados; Round (1967) trató
el fitoplancton del Golfo de California en relación con su dis-
tribución y contribución a los sedimentos; Gómez Aguirre (1969)
contribución al conocimiento del plancton; Licea (1971) la siste-
mática, distribución y variación estacional de las diatomeas de
la Laguna de Agiabampo; González (1971) Sistemática de los dino-
flagelados; Santoyo (1972) Variación estacional del fitoplancton
de la Bahía de Yavaros, Son.; Gómez Aguirre (1972) presenta la -
relación de fitoplancton cualitativo y cuantitativo de tres re-
giones, Topolobampo, Tres Marías y Balsas; Santoyo (1974) Distri

bución estacional del fitoplancton en la laguna de Yavaros, Son. Lica (1974) sistemática y distribución de las diatomeas de la Laguna de Agiabampo, Son/Sin.

LOCALIZACION DEL AREA DE ESTUDIO: Isla Tiburón se localiza a los 29º de Latitud N y 112º-113º de Longitud W (Fig. 1). La zona de muestreo se localiza en el denominado canal I. Tiburón (Fig. 1). En este estudio se hicieron observaciones en 7 estaciones: 1) Entre Jamoncillo y Punta Perla, 2) Punta Chueca, 3) Punta -- Perla, 4) Playa Jamoncillo, 5) Estero Santa Rosa, 6) Frente a -- Isla Pelícanos, 7) Estero San Miguel. Distribuyéndose de la siguiente manera: tres en la parte norte (1, 3 y 4), tres en la parte central (2, 5 y 7) y una en la parte sur (6).

MATERIAL Y METODOS: Las muestras se obtuvieron en dos visitas - que se hicieron a la zona. Las muestras de las estaciones 1, 2, 3, 4 y 5, se tomaron en el verano en agosto de 1983 y las muestras de las estaciones 6 y 7 en el otoño en noviembre de 1983; en ambas ocasiones las muestras se tomaron con una red de plancton estandar de 54 micras de malla en arrastre horizontal a nivel superficial. Se empleó el método de Edmonson (1969) para - estimar la abundancia relativa de las especies.

RESULTADOS: En la Tabla 1 se puede observar el total de especies encontradas, así como el orden de abundancia relativa en cada estación para las 10 especies más abundantes, así como las especies no reportadas anteriormente para el Golfo de California.

Se identificaron un total de 194 especies fitoplanctónicas, - las especies más frecuentes y abundantes en el estudio pertenecen a los géneros Chaetoceros, Rhizosolenia, Peridinium, Ceratium, Goniaulax, Hemiaulus, Guinardia, Cerataulina, Nitzschia, Bacteriastrum.

En la estación 1 se encontraron 84 especies y con respecto a su abundancia tenemos, Chaetoceros lorenzianus, Rhizosolenia delicatula, Rh. setigera, Bacteriastrum hyalinum, Rhizosolenia stolterforthii, Chaetoceros didymus var. anglica, Hemiaulus hauckii, Nitzschia closterium, Mastogloia sp. Thalassionema nitzschiodes.

En la estación 2 se localizaron 57 especies con respecto a su abundancia tenemos: Trichodesmium thiebauti, Guinardia flaccida, Goniaulax thriacantha, Chaetoceros laevis, Rhizosolenia stigera, Rh. stolterforthii, Chaetoceros lorenzianus, Goniaulax sp., Chaetoceros peruvianum, Rhizosolenia styliiformis.

En la estación 3 se registraron 91 especies y con respecto a su abundancia tenemos: Chaetoceros didymus var. anglica, Rhizosolenia delicatula, Chaetoceros lorenzianus, Rhizosolenia stolterforthii, Bacteriastrum hyalinum, Rhizosolenia setigera, Rh. styliiformis, Thalassionema nitzschiodes, Bacteriastrum delicatulum, Chaetoceros affinis.

En la estación 4 se localizaron 97 especies y la especie más abundante fue Chaetoceros lorenzianus y le sigue Ch. pelagicus, Ch. didymus var. anglica, Rhizosolenia delicatula, Bacterias--trum hyalinum, Chaetoceros didymus var. protuberans, Bacterias--trum delicatulum, Chaetoceros compressus, Ch. laciniosus.

Con respecto a la estación 5 se registraron 45 especies, teniendo a Rhizosolenia setigera como la especie más abundante, - le sigue Rh. stolterforthii, Guinardia flaccida, Nitzschia closterium, Chaetoceros laevis, Ch. lorenzianus, Trichodesmium thiebautii, Rhizosolenia delicatula, Hemiaulus hauckii, Corethron hystrix.

En la estación 6 se encontraron 90 especies y la especie más abundante es Nitzschia closterium, Rhizosolenia stolterforthii, Chaetoceros coarctatus, Ch. compressus, Corethron hystrix, Trichodesmium thiebautii, Chaetoceros peruvianus, Ch. laevis, Hemiaulus hauckii, Chaetoceros lorenzianus.

Para la estación 7 se registraron 83 especies y con respecto a su abundancia tenemos primeramente a Thalassionema nitzs - chiodes, le sigue Melosira sulcata, Nitzschia closterium, Chaetoceros lorenzianus, Ch. affinis, Rhizosolenia setigera, Thalassiothrix frauenfeldii, Cocconeis paniformis, Nitzschia sigmoidea, Skeletonema costatum.

De estos datos observamos que en la estación 4 el fitoplancton es más diverso y en la estación 5 hubo menos especies presentes que en las demás estaciones.

Del total, 23 especies que corresponden al 12 % son más -- abundantes y frecuentes; 21 especies que son el 11% del total - faltan por determinar específicamente.

Los géneros antes mencionados Chaetoceros, Rhizosolenia, etc. dominaron en general en los muestreos; sin embargo entre las estaciones existen diferencias de abundancia, tales que en ellos no aparecen las mismas especies como las más abundantes.

El 23% de todas las especies (45) son reportes nuevos para - el Golfo de California.

Como podemos observar en la Tabla 2 del total de especies en contradas el grupo mejor representado es el de Bacillariophyceae con 149 especies, Dinophyceae con 37 y Cyanophyceae con 8 especies.

El número de especies fitoplanctónicas identificadas es alto, por lo que considero que el canal de Isla Tiburón presenta gran diversidad.

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TABLA 1

ESTACIONES DE MUESTREO

ESPECIE	1	2	3	4	5	6	7
<i>Bacillariophyceae</i>							
<i>Actinopterychus aster</i> Brun							+
<i>A. senarius</i> (Ehr.) Ehr.*			+	+	+	+	
<i>A. splendens</i> (Shadbolt.) Ralfs						+	+
<i>A. undulatus</i> (Bail.) Ralfs						+	
<i>A. vulgaris</i> Schum.						+	
<i>Actinopterychus</i> sp. Ehr.	+			+			
<i>Amphiprora paludosa</i> Sm.	+						+
<i>Amphora decusata</i> Grunow *							+
<i>A. hyalina</i> Kutz.			+				
<i>A. lineolata</i> (Ehr.) Kutz.	+					+	+
<i>A. marina</i> (Sm.) Cl.	+		+			+	+
<i>Amphora</i> sp. (1) Ehr.	+	+	+	+	+		+
<i>Amphora</i> sp. (2) Ehr.		+	+				
<i>Asterionella japonica</i> Gran.	+	+	+	+			+
<i>Asterophalus claveanus</i> Grunow *						+	
<i>A. heptactis</i> (Bréb.) Ralfs				+		+	+
<i>Aulacodiscus kittonii</i> Arn. *			+				
<i>Auliscus caelatus</i> Bail.			+			+	
<i>A. sculptus</i> (W. Sm.) Ralfs				+			+
<i>Bacteriastrium delicatulum</i> Cleve	+	+	9	8		+	+
<i>B. elongatum</i> Cleve	+	+		+		+	
<i>B. hyalinum</i> Laud.	4	+	5	6	+		
<i>Biddulphia aurita</i> (Lyng.) Bréb. and God.		+	+	+			+
<i>B. alternans</i> (Bail.) V. H. *				+			
<i>B. dubia</i> (?) Brightw.) Cl.							+
<i>B. mobiliensis</i> (Bail.) Grun.		+		+	+	+	+
<i>B. regia</i> (Schultze) Ost. *					+		
<i>B. rombus</i> (Ehr.) W. Sm.							+
<i>B. toumeyii</i> Bail. Roper.							+
<i>Biddulphia</i> sp. Gray.						+	+
<i>Cerataulina bergonii</i> H. Pér.	+	+	+	+	+	+	
<i>Chaetoceros affinis</i> Laud.	+		10	+		+	5
<i>Ch. atlanticus</i> Cleve	+		+				
<i>Ch. coarctatus</i> Laud.						3	
<i>Ch. curvisetum</i> Cleve							+
<i>Ch. compressus</i> Laud.	+	+	+	9		4	+
<i>Ch. constrictus</i> Gran.	+		+				
<i>Ch. decipiens</i> Cleve	+	+	+	+		+	
<i>Ch. difficilis</i> Cleve	+						
<i>Ch. didymus</i> Ehr.	+			+			
<i>Ch. didymus</i> var. <i>anglica</i> (Grun.) G.	6		1	3			+
<i>Ch. didymus</i> var. <i>protuberans</i> (Laud.) Gran. and Yendo *			+	7		+	

ESTACIONES DE MUESTREO

ESPECIE	1	2	3	4	5	6	7
<i>Ch. diversus</i> Cleve						+	
<i>Ch. gracilis</i> Schutt						+	+
<i>Ch. laciniosus</i> Schutt	+	+		10		+	+
<i>Ch. laevis</i> Leud-Fort.	+	4	+	+	5	8	+
<i>Ch. lauderii</i> Ralfs. *		+	+	+			
<i>Ch. lorenzianus</i> Grun.	1	7	3	1	6	10	4
<i>Ch. pelagicus</i> Cleve *	+	4	+	2		+	+
<i>Ch. peruvianus</i> Brightw.	+	9	+	+	+	7	+
<i>Ch. radicans</i> Schutt		+	+	+			
<i>Ch. secundum</i> Cleve *		+	+		+		
<i>Ch. socialis</i> Laud.	+			+			
<i>Ch. teres</i> Cleve	+	+	+	+	+		
<i>Ch. wighami</i> Brightw. *				+			
<i>Chaetoceros</i> sp. Ehr.	+			+			+
<i>Climacodium frauenfeldianum</i> Grun.	+			+		+	
<i>Climacosphenia moniligera</i> Ehr.							+
<i>Cocconeis paniformis</i> (?) Brun.						+	8
<i>Cocconeis</i> sp. Ehr.					+		
<i>Corethron hystrix</i> Hen.	+	+	+		10	5	
<i>Coscinodiscus centralis</i> Ehr.			+	+		+	
<i>C. curvatulus</i> Grun. *			+				
<i>C. excentricus</i> Ehr.	+			+	+		+
<i>C. heteroporus</i> Ehr.	+						
<i>C. lineatus</i> Ehrenberg						+	
<i>C. marginatus</i> Ehrenberg			+				
<i>C. perforatus</i> Ehrenberg		+					
<i>C. radiatus</i> Ehr.			+	+			
<i>C. subtilis</i> Ehr.	+			+			+
<i>Coscinodiscus</i> sp. Ehr.	+	+	+	+	+	+	+
<i>Cymbella</i> sp. Ag.				+			
<i>Diploneis constricta</i> (Grun.) Cl. *	+	+	+	+			
<i>D. ovalis</i> (Hilse) Cl.	+		+			+	
<i>D. smithii</i> (Breb.) Cl. *				+			
<i>D. splendida</i> Greg.			+		+		+
<i>Ditylum brightwellii</i> (West.) Grun.	+		+	+		+	+
<i>Epithemia turgida</i> (Ehr.) Kutz. *			+	+			
<i>Eucampia cornuta</i> (Cl.) Grun. *	+		+	+		+	
<i>E. zoodiacus</i> Ehr.		+	+				
<i>Fragilaria</i> sp. Lyngbye		+				+	+
<i>Grammaphora marina</i> (Lyngb.) Kutz.			+	+			+
<i>Guinardia flaccida</i> (Castracane) Pér.	+	2	+	+	3	+	+
<i>Gyrosigma balticum</i> (Ehr.) Cl.			+				+
<i>G. spencerii</i> (Quek.) Cl.		+				+	
<i>Gyrosigma</i> sp. Has.	+			+	+		
<i>Hemiaulus hauckii</i> Grun.	7		+	+	9	9	

ESTACIONES DE MUESTREO

ESPECIE	1	2	3	4	5	6	7
<i>Hemiaulus membranaceus</i> Cl. *	+	+					+
<i>Hyalodiscus stelliger</i> Bail. *							+
<i>Leptocylindrus danicus</i> Cleve	+		+	+			
<i>Licmophora abbreviata</i> Agardh.	+						+
<i>Licmophora</i> sp. Ag.			+	+			
<i>Lithodesmium undulatum</i> Ehr.							+
<i>Mastogloia angulata</i> Levis *		+	+				
<i>Mastogloia</i> sp. Thwaites in W. Sm *	9			+	+		
<i>Melosira sulcata</i> (Ehr.) Kutz	+	+	+	+	+	+	2
<i>Navicula</i> cf. <i>brasiliensis</i> Grun.	+	+	+			+	+
<i>N. hennedyi</i> W. Sm.							+
<i>N. phoenicenteron</i> Ehrenb. *			+				
<i>N. subcarinata</i> Hend. Ralfs.				+			+
<i>Navicula</i> sp. (1) Bory	+	+	+	+	+	+	+
<i>Navicula</i> sp. (2) Bory	+	+	+	+	+		
<i>Navicula</i> sp. (3) Bory	+						
<i>Nitzschia closterium</i> (Ehr.) W. Smith	8	+	+	+	4	1	3
<i>N. distans</i> var. <i>tumescens</i> Grun. *				+			+
<i>N. longissima</i> (Brebisson) Ralfs.							
var. <i>reversa</i> W. Smith			+		+		+
<i>N. paradoxa</i> (Gmelin) Grunow						+	+
<i>N. pungens</i> var. <i>atlantica</i> Cleve		+				+	+
<i>N. seriata</i> Cleve	+		+	+	+		
<i>N. spatulata</i> Breb.			+	+			+
<i>N. sigmaidea</i> (Nitzsch.) Sm.						+	9
<i>N. vitrea</i> Norm. *		+	+				
<i>Nitzschia</i> sp. Has.	+		+	+		+	
<i>Plancktoniella sol</i> (Wall.) Schutt	+	+	+	+			
<i>Pleurosygma</i> sp. W. Sm. *	+					+	
<i>Pseudonotia doliolus</i> (Wall.) Grun.						+	+
<i>Rhizosolenia alata</i> Brightwell	+		+	+	+	+	+
<i>Rh. alata</i> var. <i>indica</i> (H. Pér.) Osten						+	
<i>Rh. bergonii</i> Peragallo	+		+				
<i>Rh. calcar-avis</i> Schultze	+	+	+	+	+	+	+
<i>Rh. delicatula</i> Cl.	2		2	5	8	+	
<i>Rh. fragillissima</i> Berg.	+		+	+		+	
<i>Rh. hebetata</i> for. <i>hiemalis</i> Gran. *				+			
<i>Rh. hebetata</i> for. <i>semiespina</i> - (Hem.) Gran.	+						
<i>Rh. imbricata</i> Brightwell	+	+	+	+		+	+
<i>Rh. robusta</i> Norman	+					+	+
<i>Rh. setigera</i> Brightwell	3	5	6	4	1	+	6
<i>Rh. stouterforthii</i> Peragallo	5	6	4	+	2	2	+
<i>Rh. styliiformis</i> Brightwell	+	10	7	+	+	+	
<i>Rhizosolenia</i> sp. (Ehr.) Brightw.		+					
<i>Rhophoneis surirella</i> (?) (Ehr.) Grun						+	
<i>Shroderella delicatula</i> (H. Per.) Pav.			+				+

ESTACIONES DE MUESTREO

ESPECIE	1	2	3	4	5	6	7
<i>Skeletonema costatum</i> (Grev.) Cl.	+		+	+			10
<i>Stephanopyxis turris</i> (Grev. and Arn.) Ralfs.	+		+	+		+	
<i>Striatella unipunctata</i> (Lyngb.) Ag.			+				
<i>Surirella cuneata</i> A. Schmidt *							+
<i>S. fastuosa</i> var. <i>lata</i> Ehr.							+
<i>S. gemma</i> (Ehr.) Kutz.						+	
<i>S. javanica</i> A.S. *				+			
<i>S. ovata</i> Kutz.							+
<i>Surirella</i> sp. Turpin			+	+			
<i>Synedra ulna</i> (Nitzsch.) Ehr.		+					
<i>Thalassionema nitzschioides</i> Hustedt	10		8			+	1
<i>Thalassiothrix delicatula</i> Cupp						+	
<i>Th. frauenfeldii</i> Grunow.	+	+	+	+		+	7
<i>Th. mediterranea</i> var. <i>pacifica</i> Cupp	+			+			
<i>Triceratium alternans</i> Bail. *				+	+		+
<i>T. favus</i> Ehr.				+		+	+
<i>Tropidoneis lepidoptera</i> (Greg.) Cl.			+				

Dinophyceae

<i>Ceratium breve</i> (Ostenfeld & Schmidt) Schroder						+	
<i>C. furca</i> (Ehr.) Dujardin	+	+	+	+	+	+	+
<i>C. fusus</i> (Ehr.) Dujardin		+	+	+	+	+	+
<i>C. inflatum</i> Kofoid						+	
<i>C. koffoidii</i> Jorgensen						+	+
<i>C. lineatum</i> (Ehrenberg) Cleve						+	
<i>C. lunula</i> (?) Schimper		+					
<i>C. macroceros</i> (Ehr.) Cleve				+		+	
<i>C. tripos</i> (O.F. Muller)					+	+	
<i>Dinophysis caudata</i> Saville-Kent	+	+	+		+	+	
<i>D. ovum</i> Schutt				+			+
<i>Dictyocha fibula</i> Ehrenberg *				+		+	+
<i>Distephanus speculum</i> (Ehr.) Haeckel *							+
<i>Exuviella</i> sp. Cienkowski	+						
<i>Goniaulax digitale</i> (Pouchet) Kofoid	+						
<i>G. pacifica</i> Kofoid *				+			
<i>G. polyedra</i> Stein				+		+	
<i>G. polygramma</i> Stein	+		+	+		+	
<i>G. spinifera</i> (Clap. & Lachm.) Diesing			+	+			+
<i>G. thriacantha</i> Jorgensen *		3			+		
<i>G. turbynei</i> Murray & Whitting	+		+	+			
<i>Goniaulax</i> sp. Diesing		8					
<i>Mesocena</i> sp. Ehrenberg			+			+	
<i>Oxytoxum scolopax</i> Stein *			+				

ESTACIONES DE MUESTREO

ESPECIE	1	2	3	4	5	6	7
<i>Peridinium claudicans</i> Paulsen *	+			+		+	
<i>P. conicum</i> (Gran.) Ostenfeld & Schmidt	+	+	+	+	+		
<i>P. crassipes</i> Kofoid			+				
<i>P. divergens</i> Ehrenberg				+			
<i>P. globulus</i> Stein *					+		
<i>P. oceanicum</i> Vannhoffen	+	+		+	+	+	+
<i>P. orbiculare</i> Paulsen				+		+	
<i>P. ovum</i> Schiller	+	+	+			+	+
<i>P. pallidum</i> Ostenfeld				+	+		
<i>P. steinii</i> Jorgensen	+					+	+
<i>Peridinium</i> sp. Ehrenberg							+
<i>Rhalsosoma ovum</i> Schutt				+	+	+	
<i>Prorocentrum micans</i> Ehrenberg	+		+	+		+	+

Dyanophyceae

<i>Calothrix crustacea</i> Schousboe and Thuret *				+			
<i>Chroococcus turgidus</i> (Kuetz.) Waegeli *			+				
<i>Lyngbya majuscula</i> Goront *						+	+
<i>Oscillatoria bonnensis</i> (?) Gruber *			+				
<i>O. ornata</i> (?) Kuetzing *		+					
<i>Rhizelia intracellularis</i> Schmidt *	+		+	+		+	
<i>Sonizothrix mexicana</i> Goront *						+	
<i>Trionectesium thiebautii</i> Goront *	+	1			7	6	
TOTAL	64	57	91	97	45	90	83

SIMBOLOGIA:

- * Especies no reportadas anteriormente para el Golfo de California
 - Especies presente en la zona.
- Los números del 1 al 10 indican el orden de abundancia relativa en cada estación, para las 10 especies más abundantes, 1 primer orden de abundancia, 2 segundo orden de abundancia, etc.

TABLA 2

RESULTADOS:	TOTAL DE ESPECIES ENCONTRADAS	
GRUPO	GENERO	ESPECIE
DYANOPHYCEAE	7	8
BACILLARIOPHYCEAE	49	149
DINOPHYCEAE	11	37
TOTAL	67	194

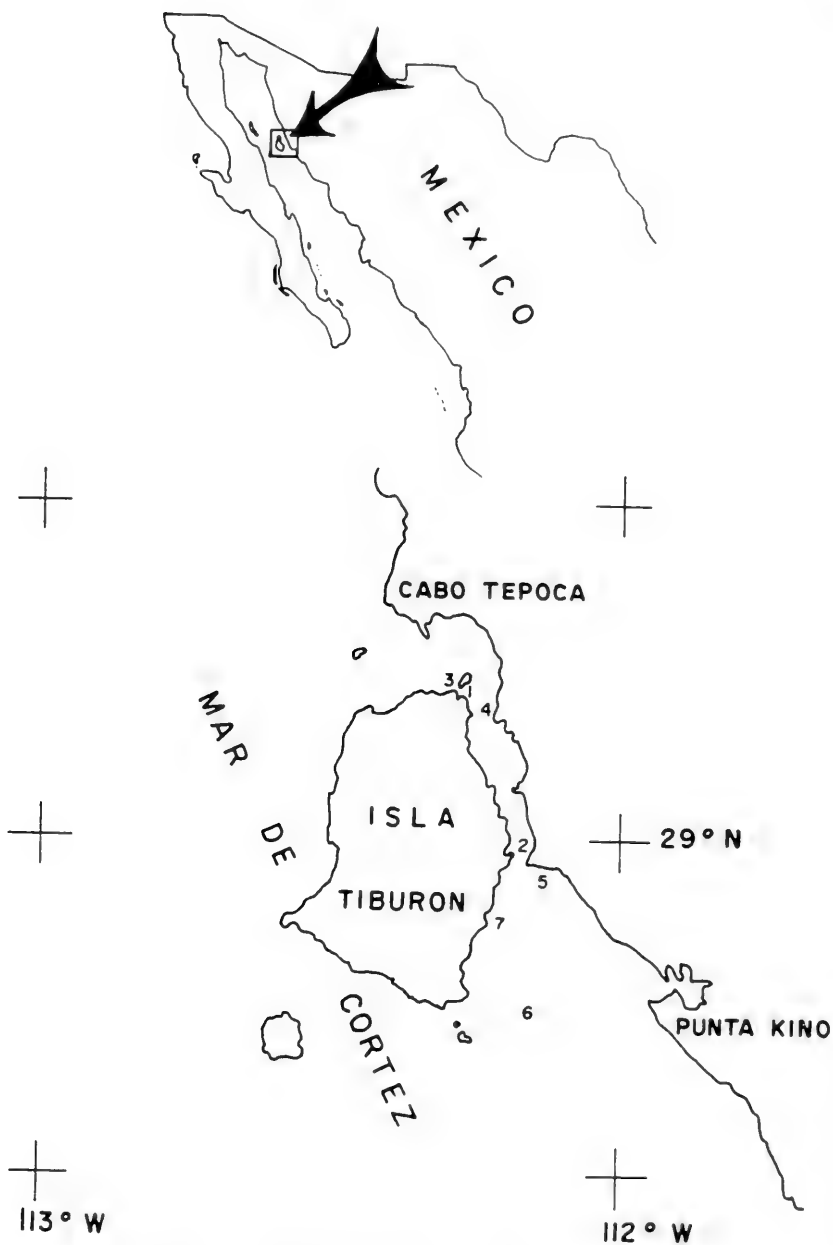


FIGURA 1. LOCALIZACION DEL AREA DE ESTUDIO

FLORA MARINA BENTÓNICA DE LA COSTA NOROESTE DEL ESTADO DE SONORA,
MEXICO. * *

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Resumen

En este trabajo presentamos los resultados obtenidos de el estudio de la flora marina bentónica, encontrada durante dos muestreos en el estado de Sonora en Bahía Kino, Isla Tiburón, Isla Pelícanos y Guaymas en 1983, las características de cada especie como; piso, modo, facies y el habitat. Encontramos 133 especies de las cuales 11 son Cyanophyta, 22 Chlorophyta, 25 Phaeophyta y 75 Rhodophyta.

Abstract

In this paper we present the results obtained in the study of the benthic marine flora encounter in two visits at Sonora state in Kino Bay, Tiburon Island, Pelícanos I. and Guaymas in 1983, -- the characteristic each one species as; floor, modo, facies and -- habitat. We encounter 133 sp. of wich are: 11 Cyanophyta, 22 --- Chlorophyta, 25 Phaeophyta y 75 Rhodophyta.

Introducción:

La costa noroeste de México, que corresponde a los estados de Sonora y parte de Sinaloa, esta bañada por las aguas del mar Cortés y es en general baja y arenosa, en algunas zonas hay relieves montañosos formando acantilados y rompientes, a lo largo de esta costa se encuentran lugares abiertos y protegidos, pudiendo ser arenosos o rocosos, numerosos fondeaderos y algunos puertos como la Bahía de Guaymas.

El golfo de California parece ser esencialmente una gran fosa tectónica dentro de la cual se han formado posteriormente, por -- nuevas y menos importantes fallas de acomodación, una serie de -- estrechos hoyos y profundas fosas de rocas efusivas del mioceno-plioceno inferior plegadas y falladas que se encuentran en la parte oeste del golfo y en las márgenes de las diferentes islas y mantos de roca volcánica en la zona de Guaymas considerados de edad terciaria. Los mantos de rocas ígneas efusivas del terciario medio y los sedimentos muy ricos en fósiles del plioceno inferior parecen haberse depositado en su mayoría en pequeñas bahías rodeadas -- de eminencias montañosas constituidas por rocas más antiguas, lito -- lógicamente los sedimentos que corresponden al plioceno son cali--

zas coralígenas, areniscas y gravas y se encuentran en las riberas occidentales del golfo, Osorio Tafall (1943).

El golfo de California, desde la desembocadura del río Colorado hasta el paralelo 23°N tiene una longitud aproximada de - 1200 Km. su anchura máxima es de 210 Km, al S. de la Isla Tiburón, el ancho es de 90 Km. y entre esta última y la isla Ángel de la Guarda se reduce a 50 Km.

En la costa de Sonora, como en otras regiones de la parte -- septentrional del golfo de California hay una marcada variación estacional. Esta se manifiesta en una notable alternancia de - plantas de invierno y verano. Este cambio estacional se debe - en su mayor parte, al influjo del desierto que rodea la parte nortena del golfo. El clima terrestre del desierto de Sonora produce por ejemplo, cambios en la temperatura del agua que -- van de 50 a 52°F en invierno hasta 88° a 91°F en verano. En el norte del golfo durante la temporada de marea baja, las plantas marinas sufren una severa desecación, una luz intensa y en general una reducida acción de la marejada. La singular varia--- ción de la temperatura, marea, circulación del agua, etc., ope-- rante sobre las distintas zonas costeras de estuarios a peñas rocosas produce una flora marina de mucho interés.

La primera publicación sobre algas marinas del golfo se basó en la colección del francés M'Diguët, gracias a una gran recolección de ejemplares biológicos en 1921 por Johnson; en 1924 se hizo un extenso estudio por Setchell y Gardner; posteriormente la expedición del Museo Field a Sonora, en el invierno de - 1939 obtuvo la primera recolección numerosa de esta costa. Esta recolección hecha por Drouet y D. Richards, así como la del - Dr. Poindexter de Pto. Peñasco en la primavera de 1941, fueron publicadas por Dawson (1944). E.V. Dawson fué el que hizo más estudios de la costa del pacífico de México y del Golfo de California, incluyendo las costas de Sonora sobre taxonomía, distribución y ecología de las algas marinas. Después de varios -- viajes por las costas mexicanas presentó una reseña sobre la - ecología y distribución de las algas marinas en las costas de Baja California y en el Golfo de California (1960). Su mayor - contribución a la flora ficológica mexicana resultado de 26 años de investigación, son sus monografías; *Marine red algae of Pacific Mexico* (1953a, 1954, 1960a, 1961, 1963a, 1962 y -- 1963b). De sus estudios posteriores, publicados después de su muerte hay dos que se refieren a las algas del Golfo, Nuevos - registros para el Golfo (1966a) y una lista de algas marinas de Pto. Peñasco, Sonora (1966b). Sus muchos estudios forman la base de las investigaciones botánicas marinas hechas en - esta área.

J. Norris (1977) hizo un estudio de la flora marina de las costas de Sonora y Baja California N., este estudio comprende muestras de profundidades hasta de 110 ft. y de la zona intermareal, también menciona que hasta esa fecha se han identificado más de 470 especies en el Golfo de California.

El objetivo del presente trabajo es conocer la flora marina bentónica obtenida durante dos muestreos en el estado de Sonora en agosto y noviembre de 1983 en las siguientes localidades; Bahía Kino, Isla Tiburón, I. Pelicanos, Guaymas y zonas cercanas (Mapa 1) así como determinar las características de cada especie como lo son; piso, facies y el habitat en que se encuentran.

Discusión y Conclusiones:

I. Pelicanos y segundo Cerro Prieto, Bahía Kino, son ambientes expuestos a fuerte oleaje con acantilados y el material obtenido de estas zonas es principalmente litoral y ocasionalmente de la infralitoral superior, la vegetación ficológica esta caracterizada por algas coralináceas como; Amphiroa dimorpha, A. zonata, Corallina polysticha, Jania mexicana, Lithophyllum samoense y Peysonnelia rubra, las cuales son abundantes y entre ellas Padina durvillaei, Codium cuneatum, Enteromorpha compressa, Prionitis acroidalea, Grateloupia filicina y Calothrix crustacea. En I. Tiburón y Cerro Roca Roja, Bahía Kino, encontramos sobre sustrato rocoso-arenoso de modo expuesto en niveles infralitoral sup. y litoral, Enteromorpha prolifera, Ulva californica, Chaetomorpha anteninna, Cladophoropsis robusta, Padina durvillaei, Sargassum lapazeanum, Lithophyllum imitans, Grateloupia versicolor, Hypnea spinella, Ahnfeltia svensoni, Rhodoglossum affine y Laurencia lajolla. En los esteros de Punta Perla, I. Tiburón y Sta. Rosa, cerca de Punta Chueca sobre Rhizophora --- mangle abunda Polysiphonia pacifica asociada con algunas cianofíceas como Microcoleus lyngbyaceus, Schizothrix calcicola y Calothrix crustacea y más escasa Rhizoclonium implexum; sobre guijarros entre el limo en aguas someras y ocupando un área de aproximadamente 500 x 100 m. Spyridia filamentosa era muy abundante. Al N. de Pta. Perla en la zona infralitoral encontramos algas epizoicas sobre Spondylus princeps y Pinna nobilis, en Sta. Rosa sobre cajas de plástico donde siembran semillas de --- ostión, se fijan algas que crecen en modos protegidos. Punta Chueca es un poblado con playa arenosa, guijarros y rocas esparcidas con oleaje moderado creciendo sobre ellos en el nivel --- infralitoral sup. y litoral se encuentran Enteromorpha acanthophora, Bryopsis pennatula, Dictyota flabellata, Gracilaria sjoestedtii, G. verrucosa, Gymnogongrus leptophyllus, Chondria dasyphylla, Polysiphonia mollis, Spyridia filamentosa, etc. En Guaymas muestreamos en el nivel infralitoral superior y litoral, en esta Bahía existe una laguna que drena hacia el mar por una salida que tiene fondo arenoso con guijarros y rocas, sobre estas abundaba Gracilaria sjoestedtii, G. verrucosa y Spyridia filamentosa, en esta zona a diferencia de las otras localidades, la influencia humana es mayor y se observa gran cantidad de desechos y constantes descargas de drenaje directamente hacia el mar por lo que la vegetación sobre rocas en modos expuestos y semiexpuestos estaba constituida principalmente por: Lithophy-

llum imitans, Dictyota flabellata, Sargassum sinicola, Calo-
thrix crustacea, Microcoleus lyngbyaceus y Brachytrichia quoyi,
entre la arena y sobre guijarros Caulerpa sertularioides, Padi-
na durvillaei y Cladophoropsis macromeres, sobre paredes de con-
creto abundaban clorofíceas como Enteromorpha compressa, Clado-
phora columbiana y Rhizoclonium implexum.

Analizando los datos obtenidos en el cuadro 1, de todas las -
localidades revisadas tenemos representados a los diferentes --
grupos de algas por número de especies y porcentaje de la si--
guiente manera: Cyanophyta 11 sp. 8.28 %, Chlorophyta 22 sp. --
16.54 %, Phaeophyta 25 sp. 18.80 % y Rhodophyta 75 sp. 56.38 %.
Siendo el número total de especies para los dos muestreos de -
133.

Como mencionamos anteriormente en las zonas rocosas expuestas
y semiexpuestas encontramos una clara dominancia de algas calcá-
reas asociadas con otras algas pequeñas, densamente agregadas y
fuertemente arraigadas, en los manglares abundaban Polysiphonia
y cianofíceas, en la zona de Guaymas dominaban las cianofíceas
y clorofíceas y en todas las zonas revisadas la especie más fre-
cuente fué Spyridia filamentosa. Estos resultados nos ratifican
la riqueza florística de este lugar mencionada anteriormente --
por E.V. Dawson y J.N. Norris.

Agradecimientos.

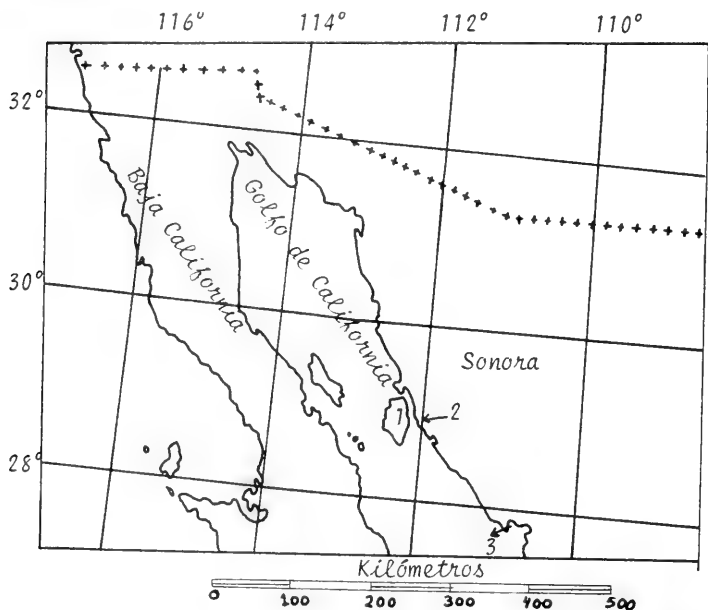
Queremos hacer patente nuestro agradecimiento al M. en C. --
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MAPA 1



1.- I. Tiburón, 2.- Bahía Kino, 3.- Bahía de Guaymas

	I	II	III	IV	V	VI	VII	PISO	MODO	FACTES	HAB.	ASOC. A.	EPFITTA DE	ESTADO
17.- <i>B. hypnoides</i> Lamouroux		+					+	L	Ex	R	epl	74		0
18.- <i>B. pennatula</i> J. Ag.					+			L	Ex	R	s/g	5		0
Fam. Codiaceae														
19.- <i>Codium cuneatum</i> S. & G.		+	+					Is	Sex	R	epl			G
20.- <i>C. tomentosum</i> (Huds.) Stackhouse *			+					Is	P	R	epl	-	-	0
Fam. Caulerpaceae														
21.- <i>Caulerpa racemosa</i> (Forsskal.) J. Ag. *							+	Is	Sex	RA	psm	-	-	0
22.- <i>C. sertularioides</i> (Gmel.) Howe.							+	Is	Sex	RA	epl psm	-	-	0
DIV. CHROMOPHYCOPHYTA														
Fam. Ectocarpaceae														
23.- <i>Ectocarpus confervoides</i> (Aresch.) Kjell- man f. <i>pigmaeus</i> . *						+		L	Sex	-	epl	-	64	G
24.- <i>E. granulosus</i> (Eng. Bot.) Ag. *						+		L	Sex	-	epl	-	20	G
25.- <i>E. parvus</i> (Sond.) Hollenb.						+		L	Ex	-	epl	-	114	Z
26.- <i>Giffordia mitchelliae</i> (Harv.) Ham.						+		L	Ex	-	epl	-	99, 47	G
Fam. Myrionemataceae														
27.- <i>Compsomena secundum</i> f. <i>terminale</i> S. & G.		+				+		L	Ex	-	epl	3	39	G
Fam. Cutleriaceae														
28.- <i>Cutleria hancockii</i> Dawson *							+	Is	P	R	epl	-	-	0
Fam. Asperococcaceae														
29.- <i>Asperococcus bulbosus</i> Lamouroux *						+		Is	P	R	epl	-	-	0
30.- <i>A. echinatus</i> (Martens) Grev. *						+		Is	P	R	epl	-	-	0
Fam. Scytosiphonaceae														
31.- <i>Colpomenia sinuosa</i> Derbes et Solier *						+		L	P	R	epl	-	-	0

	I	II	III	IV	V	VI	VII	PISO	MODO	FACTES	HAB.	ASOC. A.	EPÍFITA DE	ESTADO
32.- <i>Endarachne binghamiae</i> J. Ag. *				Ca	bo	e	po	ca	L	P	R	epl	-	0
33.- <i>Hidrocalthrus clathriatus</i> (Bory) Howe						+			L	Ex	R	epl	-	0
34.- <i>Petalonia fasciata</i> (O.F. Miller) Kuntze *				Pto. Libertad, Son.				Is	P	R	epl			
Fam. Dictyotaceae														
35.- <i>Dictyota dichotoma</i> (Huds.) Lam.	+								L	Ex	R	epl	-	0
36.- <i>D. divaricata</i> Lamouroux									L, Is	Sex	R	epl	-	0
37.- <i>D. flabellata</i> (Coll) S. & G.									L, Is	Ex	R	epl	-	0
38.- <i>Padina caulescens</i> Thivy *					+				Is	P	R	epl	-	0
39.- <i>P. durvillaei</i> Bory					+				Ex	Sex	R	epl	60, 65, 74, 42	0
40.- <i>P. gymnospora</i> (Kuetz.) Vickers *					+	+	+	+	L, Is	P	-	-	-	0
Fam. Chnoosporaceae														
41.- <i>Chnoospora pacifica</i> J. Ag. *				Bahía San Pedro				L	Ex	R	epl			
Fam. Sargassaceae														
42.- <i>Sargassum agardhianum</i> J. Ag. *							+		Is	P	Lg	s/g	39, 45	0
43.- <i>S. johnstonii</i> S. & G.							+		L	Ex	R	epl	-	0
44.- <i>S. lapazeanum</i> S. & G.					+				L	Ex	R	epl	-	0
45.- <i>S. sinicola</i> S. & G.							+		Is	Sex	R	epl	42	0
46.- <i>S. sinicola</i> V. <i>sinicola</i> . Norris & Vensen							+		L	Ex	R	epl	-	0
47.- <i>S. sinicola</i> V. <i>canaliculata</i> (Dauv) N. & Vensen	+								L, Is	Ex, Sex	R	epl	50	0
DIV. RHODOPHYTA														
Fam. Goniotrichaceae														
48.- <i>Goniotrichum alsidii</i> (Zan.) Howe					+				L	Ex	-	epl	74	0
49.- <i>Asterocylis namosa</i> (Thwaites) Schmitz.	+								L	Ex	R	epl	47	0

	I	II	III	IV	V	VI	VII	PLSO	MODO	FACIES	HAB.	ASOC. A.	EPÍFITA DE	ESTADO
Fam. Gelidiaceae														
50.- <i>Gelidiella hancockii</i> Dawson		+						L	Ex	R	epl	47	-	Ø
51.- <i>Gelidium coulteri</i> Harvey								L	Ex	R	epl	56	-	Ø
52.- <i>G. johnstonii</i> S. & G.		+						L	Ex	R	epl	75	-	Ø
53.- <i>G. pusillum</i> (Stackhouse) Le Jolis		+						L	Ex	R	epl	63, 70	-	Ø
54.- <i>G. sclerophyllum</i> Taylor								L	Ex	R	epl	63, 70	-	Ø
55.- <i>Pterocladia capillacea</i> (Gmel.) Bornand Thuret		+						L	Ex	R	epl	61, 97	-	Ø
56.- <i>P. complanata</i> Loomis		+						L	Ex	R	epl	51, 97	-	Ø
Fam. Squamariaceae														
57.- <i>Peyssonelia rubra</i> V. orientalis Weber-van Bosse.							+	L	Ex	R	epl	63	-	Ø
Fam. Corallinaceae														
58.- <i>Amphiroa brevianiceps</i> Dawson		+						L	Ex	R	epl	63, 64	-	Ø
59.- <i>A. croslandii</i> Lemoine							+	L	Ex	R	epl, epz	60, 70, 3	-	Ø
60.- <i>A. dimorpha</i> Lemoine							+	L	Ex	R	epl	59, 70	-	Ø
61.- <i>A. drouetii</i> Dawson		+						L	Ex	-	epz	55, 65	-	Ø
62.- <i>A. franciscana</i> Taylor		+						L	Ex	R	epl	114	-	Ø
63.- <i>A. mexicana</i> Taylor		+	+					L	Ex	R	epl	97	-	Ø
64.- <i>A. subcylindrica</i> Dawson			+					L	Ex	R	epl	58, 63, 114, 54	-	Ø
65.- <i>A. zonata</i> Vendo		+	+					L, 1, 6	Ex	R	epl	58, 63, 76, 65	-	Ø
									Sex	A	psm	61, 64, 63, 70	-	Ø

	I	II	III	IV	V	VI	VII	PISO	MODO	FACTES	HAB.	ASOC. A.	EPFITA DE	ESTADO
66.- <i>Corallina frondescens</i> Post. & Rupr. *			+					L	Ex	R	epl	-	-	0
67.- <i>C. officinalis</i> var. <i>chilensis</i> (Dec.) * Kütz.							Pto. Peñasco (poza de marea)	L	P	R	epl	-	-	0
68.- <i>C. pinnatifolia</i> Manza *			+					L	Ex	R	epl	-	-	0
69.- <i>C. polysticha</i> Dawson *			+					L	Ex	R	epl	-	-	0
70.- <i>C. vanouvierensis</i> Vendo			+					L	Ex	R	epl	60, 65 78	-	0
71.- <i>Fosliella farinosa</i> (Lam.) Howe				+				Is	P	-	epz	110	39	0
72.- <i>F. paschalis</i> (Lem.) S. & G.				+				L	Sex	-	epf	-	55	0
73.- <i>Jania decussato-dichotoma</i> (Vendo) Vendo *							Puerto Peñasco	L	Ex	R	epl	-	-	0
74.- <i>J. mexicana</i> Taylor	+	+	+	+				L	Ex	R	epl epz	64, 65 82, 60 58	-	0
75.- <i>Lithophyllum imitans</i> Foslíe			+					L	Ex	R	epz	52	-	0
76.- <i>L. pallescens</i> (Foslíe) Hejdr.			+					L	Ex	R	epl	64	-	0
77.- <i>L. samoense</i> Foslíe				+				L	Ex	R	epl epz	60	-	0
Fam. Cryptonemiaceae												70		
78.- <i>Prionitis aotoidalea</i> (?) (S. & G.) Dawson			+					L	Ex	R	epl	80	-	0
79.- <i>P. australis</i> (J. Ag.) J. Ag.	+							L	Ex	R	epl	-	-	0
Fam. Kallimeniaceae												-	-	0
80.- <i>Callophyllis violaceae</i> J. Ag. *							+	L	Ex	R	epl	-	-	0
Fam. Grateloupiaaceae														
81.- <i>Grateloupia abbreviata</i> (?) Kylin			+					L	E	R	epl	78	-	0
82.- <i>G. filicina</i> (Wulf.) C. Ag.			+					L	Ex	R	epl	-	-	0
83.- <i>G. setchellii</i> Kylin	+							L	Ex	R	epl	74	-	0
84.- <i>G. versicolor</i> (?) (J. Ag.) J. Ag.			+	+				L	Ex	R	epl	87	-	0, 0

	I	II	III	IV	V	VI	VII	PISO	MODO	FACTES	HAB.	ASOC. A.	EPÍFITA DE	ESTADO
Fam. Champiaceae														
102.- <i>Champia parvula</i> (C.Ag.) Harv.	+							L	Sex	-	epb	97	63, 117	0
103.- <i>Ceolosebra parva</i> Hollenb.		+						L	Sex	-	epb		65	0
Fam. Ceramiaceae														
104.- <i>Callithamnion rupicolum</i> Anders							+	Is	P	-	epb		47	0
105.- <i>Ceramium caudatum</i> (?) S. & G.		+						L	Sex	-	epb	108	19	0
106.- <i>C. fimbriatum</i> S. & G.		+						L	Sex	-	epb	-	37, 47	0
107.- <i>C. gracillimum</i> v. <i>byssoideum</i> Feldman-Mazoyer	+							L	Sex	-	epb	-	47	0
108.- <i>C. sinicola</i> S. & G.		+						L	Sex	-	epb	105, 115	19	0
109.- <i>C. zaca</i> S. & G.	+							L	Sex	-	epb	59, 122	74	0
110.- <i>Centroceras clavulatum</i> (C.Ag.) Montagne	+		+					L, Is	Ex, P	R	epb	-	112, 113	0
111.- <i>Griiffithsia pacifica</i> (?) Kylin		+	+					L, Is	Ex, P	-	epb	-	84	0
112.- <i>Spyridia filamentosa</i> (Wulf.) Harvey		+	+	+	+			Is	P	R	epb	86	0	
Fam. Rhodomelaceae														
113.- <i>Chondria dasphylla</i> (Woodw.) C.Ag.					+			Is	P	R	epb	-	0	
114.- <i>Digenia simplex</i> (Wulf.) C.Ag.	+							L	Ex	R	epb	90, 117	0	
115.- <i>Herposiphonia tenella</i> (C.Ag.) Ambrosini		+						L	Sex	-	epb	108	19	0
116.- <i>Laurencia lajolla</i> Dawson		+	+					L	Ex	R	epb	87, 65	-	0
117.- <i>L. pacifica</i> Kylin	+							L	Ex	R	epb	99-115	-	0
118.- <i>L. parvulata</i> (C.Ag.) J.Ag.							Isla Tiburón							
119.- <i>L. sinicola</i> S. & G.							Isla Tiburón	Intermareal						
120.- <i>Polysiphonia mollis</i> Hooker & Harvey			+	+				L, Is	Ex, P	R	epb	-	0	
121.- <i>P. pacifica</i> v. <i>pacifica</i> Hollenb.				+	+			Is	P	R	epb	-	0	

	I	II	III	IV	V	VI	VII	PISO	MODO	FACTES	HAB.	ASOC. A.	EPFITA DE	ESTADO
122.- <i>Tayloriella dictyurus</i> (J. Ag.) Kyllén	+							L	Ex	R	epb	-	110	0
DIV. CYANOPHYCOPHYTA														
Fam. Chroococcaceae														
123.- <i>Anacystis dimidiata</i> (Kütz.) Drouet & Daily.			+					L	Sex	-	epb	129, 131	127	As
Fam. Chamaesiphonaceae														
124.- <i>Entophysalis conferta</i> Drouet & Daily.			+					L	Sex	-	epb	125	39	As
125.- <i>E. deusta</i> Drouet & Daily			+					L	Sex	-	epb	124	39	As
126.- <i>E. endophysatica</i> Drouet & Daily			+					L	Sex	-	epb	53	53	As
Fam. Oscillatoriaceae														
127.- <i>Microcoleus lyngbyaceus</i> (Kütz.) Crouan	+	+	+	+	+	+	+	L		R	epb	129, 130, 131	5, 19, 75, 112, 117	As
128.- <i>Schizothrix arenaria</i> (Berkeley) Gomont					+			Is	P	-	epb	-	110	As
129.- <i>S. calcicola</i> (C. Ag.) Gomont					+			Is	P	L	s/ lino	119 123		As
130.- <i>S. mexicana</i> Gomont		+						L	Ex	R	epb	-	-	As
131.- <i>Spirulina subsalsa</i> Oersted		+									epb	119, 123	127	0
Fam. Nostocaceae														
132.- <i>Calothrix crustacea</i> Schousboe & Thured	+	+	+	+	+	+	+	L, Is	P Sex	As	psm epb	123,	19, 45, 54, 67, 109, 115	As
Fam. Stigonemataceae														
133.- <i>Brachytrichia quoyi</i> (C. Ag.) Bornet & Flahault							+	L	Ex	R	epb			As

SIMBOLOGIA:

Localidad	I - Segundo Cerro Prieto, Bahía Kino
	II - Roca Roja, Bahía Kino
	III - Isla Pelícanos
	IV - Isla Tiburón y Estero Punta Perla
	V - Punta Chueca
	VI - Estero Santa Rosa
	VII - Guaymas

PISO: L = Litoral

Is = Infralitoral superior

ESTADO:

MOD0: Ex = Expuesto,
 Sex = Semiexpuesto
 P = Protegido

FACIES: R = Rocosa
 A = Arenosa
 RA = Rocoso-arenoso

HAB: psm= psamófila
 epz= epizoico
 epf= epífita
 epl= epilítica
 D = arrojado por las olas.

0 = vegetativo
 Ø = tetrasporas
 As = Asexual
 Ø[→] = espermaties
 ♀ = cistocarpos y carpogonios en Rhodophyta; oogonios en Phaeophyta
 G = Cistos Chlorophyta
 Z = zooidocistos.

** Este trabajo fué parcialmente subvencionado por la Dirección General de Graduados del I.P.N.

* Ejemplares consultados en el herbario ENCB.

ALGAS MARINAS POCO COMUNES DE LAS COSTAS MEXICANAS (I)

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Resumen

Esta publicación reporta por primera vez el alga marina *Ochtodes secundiramea* para la costa mexicana con una descripción de las plantas tetrasporicas, ramas carpogoniales, cistocarpicas y spermatangiales.

Abstract

This paper reports for first time of the marine algae *Ochtodes secundiramea* for Mexican shores; with description of the plants tetrasporic, carpogonial branches, cistocarps and spermatangials.

Ochtodes secundiramea (Mont.) Howe (= *O. filiformis* J. Ag.) J. Ag. cf. Howe 1920 p. 583 fue reportada del Atlántico Nor occidental y posteriormente Taylor (1960) describe plantas sexuales de Bahamas, Cuba, Jamaica, Hispaniola, Pto. Rico, San Bartolomé, Guadalupe, Martinica, Barbados, Granada, Honduras Británicas, Costa Rica, Panamá y Trinidad Tobago; Joly y Yumiko Ugadim (1966) la recolectaron de las costas de Guarapari, Meipi e Iriri en el estado de Espírito Santo (femenina y tetraesporica) y en el arrecife de Mar Grande, I. Itaparica, estado de Bahía en Brazil (masculina, femenina y tetraesporica); en este trabajo hacen la primera referencia del género y la especie para el Atlántico Sur Occidental, así mismo describe por primera vez los tetraesporocistos, los detalles de organización del ramo carpogonial, ramas auxiliares y de espermatocistos.

Este es el 1er. reporte para México de *Ochtodes secundiramea* - (Gigartinales) Rhizophyllidaceae. Los primeros ejemplares de esta especie fueron localizados en noviembre de 1984 en I. Cozumel Q.-Roo junto al faro nuevo, eran ejemplares pequeños de 1 cm de alto y en estado vegetativo. Posteriormente en febrero de 1985 la encontramos distribuida desde aproximadamente 500 m del muelle a 1 km al Sur de I. Cozumel, estos ejemplares median 3 cm de alto y presentaban fases gaméticas femeninas con carpogonios y cistocarpos, masculinas así como también tetrasporicas, en junio de 1985 la localizamos en esta misma zona pero exclusivamente la fase tetrasporica.

Descripción.

Nuestros ejemplares son erectos cilíndricos de color rojo vino - brillante a rojo rosado de consistencia subcartilaginosa, textura suave y resbaladiza con múltiples ramificaciones dicotómicas, la planta tetraspórica primeramente es dicotómica y las ramas terminales se disponen irregularmente, en todas las plantas algunas ramas terminales presentan torciones muy marcadas (fig. 3,4) y otras son cilíndricas derechas (fig. 5), miden 1-3 cm de alto por 2.5 a 3 cm de ancho (fig. 1)., las ramas terminales presentan 2 células apicales muy claras (fig. 6) el diámetro del talo es de 350 a 576 micras y en corte transversal se observan de 4 a 6 capas de células corticales, en las partes maduras aumentan estas capas -- (fig. 7,8,9 y 10), las células corticales más cortas y redondeadas miden 7 x 7 micras y después se hacen más alargadas de 17.5-28 micras de long. por 8.7-14 micras de diám., entre ellas hay células glandulares de 42 micras de long. por 14 micras de diám. (fig. 9) y hacia la médula hay células globosas de 52.5 a 122 micras de diámetro, filamentos de 3-10.5 micras de diámetro que se distribuyen desde la zona medular hasta la corteza, en el eje hay dos filamentos medulares y a veces 3 (figs. 9 y 10) miden 87.5-112 micras de long. por 35 micras de diám. en corte longitudinal y 35-49 micras por 49-77 micras en corte transversal, tiene pelos unicelulares en las partes superiores.

Plantas femeninas.

Talos de 1.7 cm de alto, los carpogonios se desarrollan en nematecios laterales en las ramas, (fig. 13) y estan constituidos por las ramas carpogoniales con 2 células las cuales nacen de una célula de soporte y 3 células auxiliares que son muy notorias por su contenido mas denso (fig. 14), las células auxiliares miden 63 x 10.5 micras, los carpogonios miden 45.5-56 micras de longitud x 10.5 micras de diámetro, los cistocarpos maduros son abundantes y sobresalen mucho de las ramas (fig. 2) miden 245 micras de diámetro y en corte transversal se observa el cistocarpo con abundantes carposporas en agregados y entre ellas pequeños filamentos, las carposporas miden 10.5-14-17.5 micras de diámetro. (fig. 15).

Plantas masculinas.

Los talos miden 3 cm de alto, los espermatocistos se forman en nematecios en las partes superiores de la planta y a veces rodea totalmente la rama o bien sólo se forma lateralmente y la zona cortical crece también en este nivel, los nematecios jóvenes tienen 4 ó 5 células dispuestas radialmente y las más externas de estas se dividen transversalmente produciendo 3 ó 4 células las que se dividen longitudinalmente produciendo 6 a 8 espermaties que son incolores y se liberan por la pared gelatinizada; los espermaties miden 1 micra de diám. (figs. 16 y 17)

Plantas tetraspóricas.

Estos talos miden 1.5 cm de alto, son de menor tamaño y se ramifican de manera más densa que los talos sexuales, los tetrasporocistos se desarrollan en nematecios a lo largo del talo y crecen de manera extensiva sobre las ramas sin rodearla totalmente, en -- corte transversal se observa que se forman a partir de la zona cortical que no se modifica y sin filamentos estériles entre ellos -- los tetrasporocistos se dividen zonada y oblicuamente, miden 28 micras de alto x 14 micras de diámetro 28-32 μ de alto x 13-14 μ de diám. (figs. 11 y 12).

La descripción de esta especie coincide con las claras observaciones dadas por Joly y Yumiko (1966) en su trabajo donde reportan talos de 5 a 17 cm de alto, Taylor (1960) recolectó ejemplares de 4-12 cm de alto y nuestros ejemplares adultos miden 1.5 a 3 cm de alto por lo que consideramos que esta diferencia se debe al habitat en el cual esta creciendo, ya que fueron colectadas sobre rocas en zona litoral muy golpeadas por las olas; desarrollandose espaciada mente entre otras algas como: Hypnea musciformis y Gracilaria millaris.

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LAMINA I

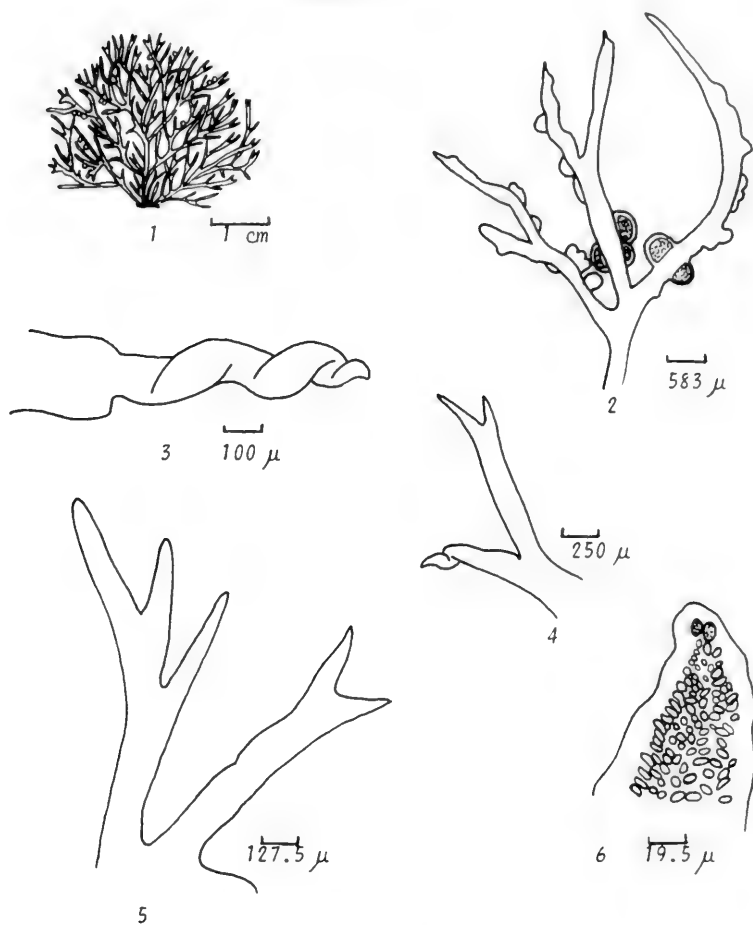
Ochodes secundiramea

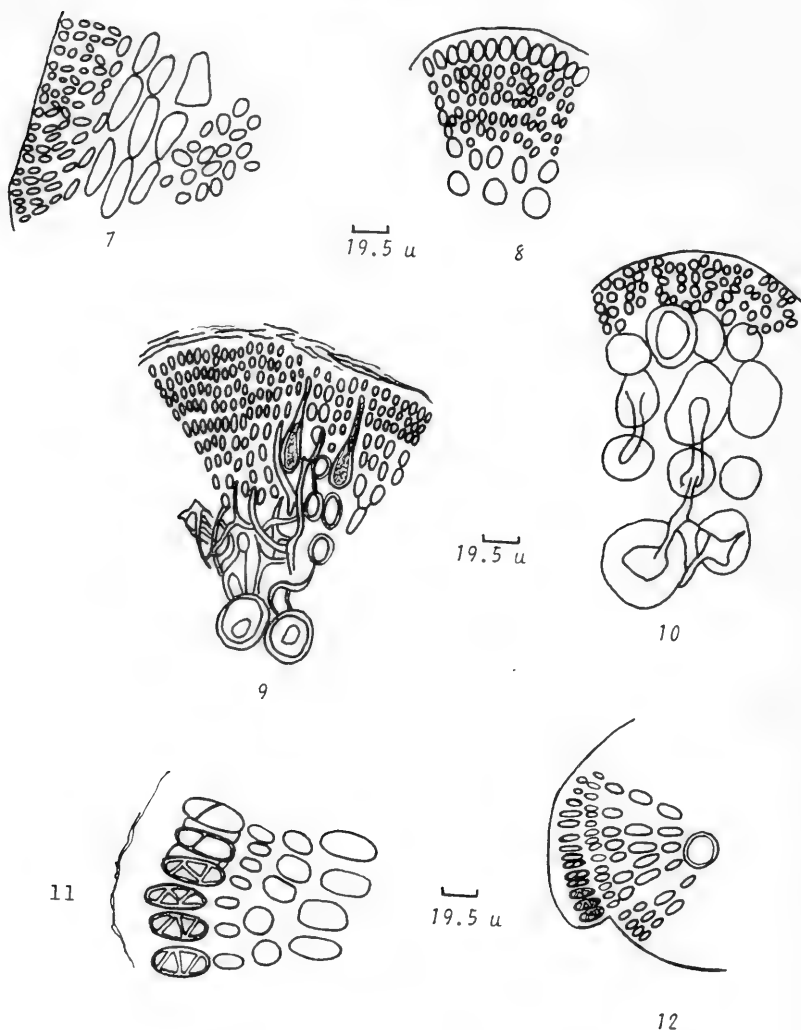
Fig. 1 Aspecto general del talo femenino.

Fig. 2 Ramas con cistocarpos.

Fig. 3,4,5, Ramas terminales vegetativas note las ramillas con torciones.

Fig. 6 Corte longitudinal de un ápice con sus dos células.

LAMINA II

*Ochtodes secundiramea*

- Fig. 7, 8, 9. Corte transversal de talos vegetativos jóvenes.
 Fig. 10. Corte transversal del talo maduro, observe el crecimiento de la corteza y las células glandulares.
 Fig. 11 y 12. Corte transversal de talo tetraspórico: Observe las tetrasporas zonadas -- oblicuamente y la formación del nematecio.

LAMINA 177

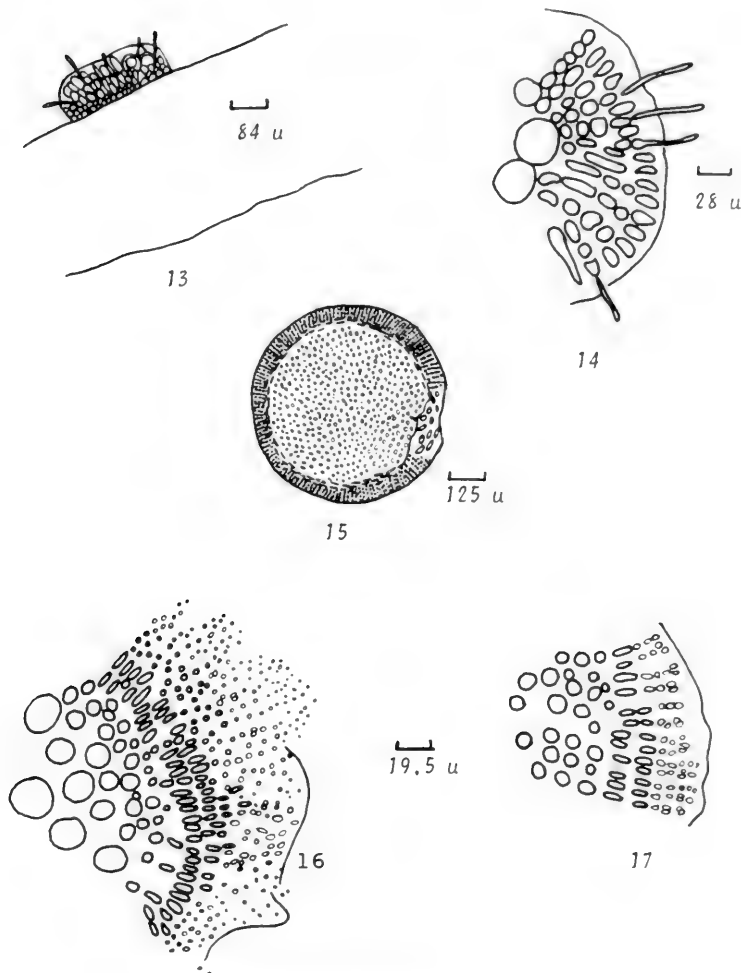
*Ochtodes secundiramea*

Fig. 13,14. Corte transversal de talo femenino, con carpogonios.

Fig. 15. Corte transversal de un cistocarpo.

Fig. 16. Talo masculino joven.

Fig. 17. Talo masculino maduro.

Todas las figuras originales.

ALGAS MARINAS POCO COMUNES DE LAS COSTAS MEXICANAS (II)

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Resumen

Esta publicación describe la estructura de los tetrasporangios, cistocarpos y estiquidios espermatangiales de Pterochondria woodii Var. pygmaea (Setch.) Daws. en ejemplares reportados por 1ª vez para Bahía Tortugas, B.C.S. por Mendoza-González y Mateo-Cid -- (1985).

Abstract

This paper describe the structure of the tetrasporangia, cistocarps and spermatangial stichidia of Pterochondria woodii Var. -- pygmaea (Setch.) Daws. in plants reports for first time for Bahía Tortugas, B.C.S., for Mendoza-González y Mateo-Cid (1985).

Pterochondria woodii Var. pygmaea (Setch.) Dawson es una especie que se encuentra distribuida desde Sta. Bárbara California hasta - Bahía Asunción B.C. (Abbott 1976), fué registrada por primera vez para Bahía Tortugas B.C. por las autoras en 1985 y en el presente trabajo se hace la descripción de los talos gametofíticos masculino y femenino así como tetraesporofítico. Existen ejemplares vegetativos en el Herbario E.N.C.B. de Puerto Escondido, Ensenada B.C. de Octubre de 1975 y encontramos talos gamético masculinos, femeninos y tetraesporicos en Bahía Tortugas, B.C. en junio de 1983 obtenidos del nivel infralitoral; estos ejemplares son talos pequeños epífitos de Halidrys dioica y Cistoseira setchellii, miden .5 a 1 cm de alto, son fuertemente aplanados y de aspecto membranoso muy ramificado, las ramas son divergentes y disticas (fig. 1), -- tiene un color rojo vino, se adhiere por rizoides y las últimas - ramas presentan una clara célula apical de 10 μ de diámetro; en - corte observamos 14 células pericentrales en la base y sólo dos - capas de células cerca del ápice de 100 μ de longitud y 15 μ de diámetro (fig. 2) las células de la parte basal miden 30-50 μ de diámetro.

Los talos masculinos tienen de .5 a 1 cm de alto, la base de -- 500 μ de diámetro y las últimas ramas miden 125-187 μ de diámetro, presenta estiquidios espermatangiales de 60-168 μ de longitud por

25-126 μ de diámetro y se desarrollan entre dos ramas que se curvan sobre él (fig. 3-5).

El talo femenino tiene 1 cm de alto y en la base 400 μ de diámetro, las últimas ramas miden 312 μ de diámetro, los cistocarpos son globosos, laterales y subterminales de 390-487 μ de diámetro las carposporas son de 187-250 μ de longitud por 31-62 μ de diámetro y diseminan por un poro apical (fig. 6).

El tetraesporofito mide 1 cm de alto y los tetraesporocistos se desarrollan uno por segmento en estiquidios, las tetraesporas miden 60 μ de diámetro y los tetraesporocistos son de 109-125 μ de diámetro (fig. 7).

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Pterochondria woodii Var. pygmaea

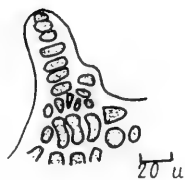
- Fig. 1 Aspecto general del talo.
- Fig. 2 Apice de una rama.
- Fig. 3 y 4. Estiquidio espermatangial inmaduro.
- Fig. 5 Talo masculino con estiquidios espermatangiales.
- Fig. 6 Talo femenino con cistocarpos.
- Fig. 7 Talo tetraspórico con tetrasporocistos.

Todas las figuras originales.

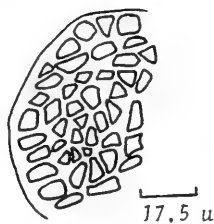
LAMINA I



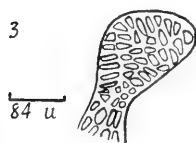
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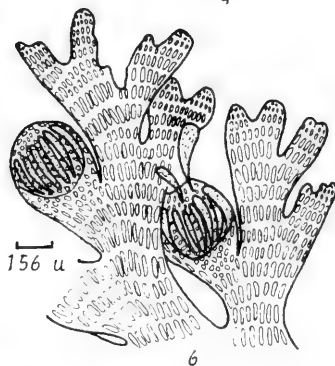
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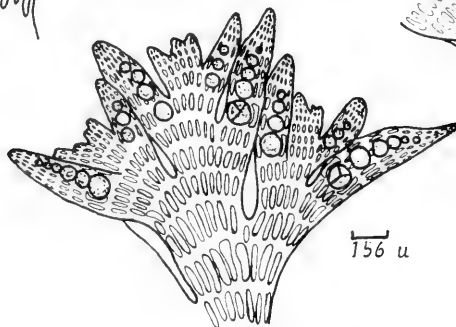
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ALGAS MARINAS POCO COMUNES DE LAS COSTAS MEXICANAS (III)

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Resumen

Esta publicación da la primera noticia de la especie Aglaothamnion neglectum Feldmann-Mazoyer en la costa Atlántica Mexicana - con una descripción detallada de la especie. Esta fue previamente conocida del Mediterráneo y Brazil Feldmann-Mazoyer (1940), Joly (1957) y Oliveira Filho (1969).

Abstract

This paper gives first notice of the Aglaothamnion neglectum -- Feldmann-Mazoyer in the Atlantic Mexican Coast; with description in detail of this specie. These were previously known to occur at the Mediterranean and Brazil Feldmann-Mazoyer (1940), Joly (1957) and Oliveira Filho (1969).

Aglaothamnion neglectum Feldmann-Mazoyer es una especie descrita por la Dra. Genévive Feldman-Mazoyer (1940), en base a un material que localizó epífita de Udotea petiolata (tuna) y Bryopsis balbisiana en la estación zoológica de Villefranche-sur-mer en otoño de 1938, posteriormente Joly, A.B. (1965) describe un material recolectado epífita de Codium taylori en Playa Lamberto, Municipio de Ubatuba mencionando que es una especie rara en la región. Oliveira Filho (1967) reporta esta especie epífita de Heterodasya sertularioides de la Playa de Paracanga y Guaibura (29-VII-65), Playa Acayaca (1-V-66) y material de A.B. Joly y Col. de Playa de Base Ubatuba (S.P.) (23-III-63); nosotras la encontramos epífita de Grateloupia filicina en un material recolectado por L. Huerta y L.E. Mateo en las escolleras de Tuxpam, Veracruz en junio de 1984. Son ejemplares de aspecto plumoso muy delicados de color rojo-vino a rojo-rosado abundantemente ramificado. Las plantas masculinas miden 1.5 cm de alto, las femeninas de 1 cm y las tetraesporicas de .8 cm, se fijan al hospedero por medio de rizoides pluricelulares (figs. 2 y 3). El talo presenta una ramificación primaria alterna en todos los planos, las ramas secundarias son dicotómicas y en un solo plano. Ejes principales con células de la base de 135-150 micras de diámetro por 155 micras de long.

las células de las partes superiores miden 66 micras de diámetro por 176 micras de longitud, las ramillas están constituidas por células de 27 micras de diámetro.

La parte basal del eje presenta una ligera corticación por rizoides pluricelulares (fig. 1) las células tienen un sólo núcleo y -- numerosos plastos alargados (figs. 4 y 5).

Los talos femeninos tienen un ramo carpogonial constituido por células dispuestas en zig-zag, los gonimoblastos se colocan de dos en dos sobre la célula de la rama a uno y otro lado de la misma y están formados por dos ó tres gonimolobos irregularmente lobados-- (figs. 10-15) produciendo numerosas carposporas, los gonimoblastos miden de 162-305 micras de diámetro por 311-474.6 micras de alto, -- carposporas de 27-41 micras de diámetro.

Los talos masculinos presentan los espermatocistos insertados -- unilateralmente en las ramas y ramillas generalmente sobre el lado interno de la rama, se observan muy densos y con un pequeño mucílago rodeándolos, los espermatocistos miden 7.2 micras de diámetro y los espermáticos 3.6 micras. (fig. 6-9).

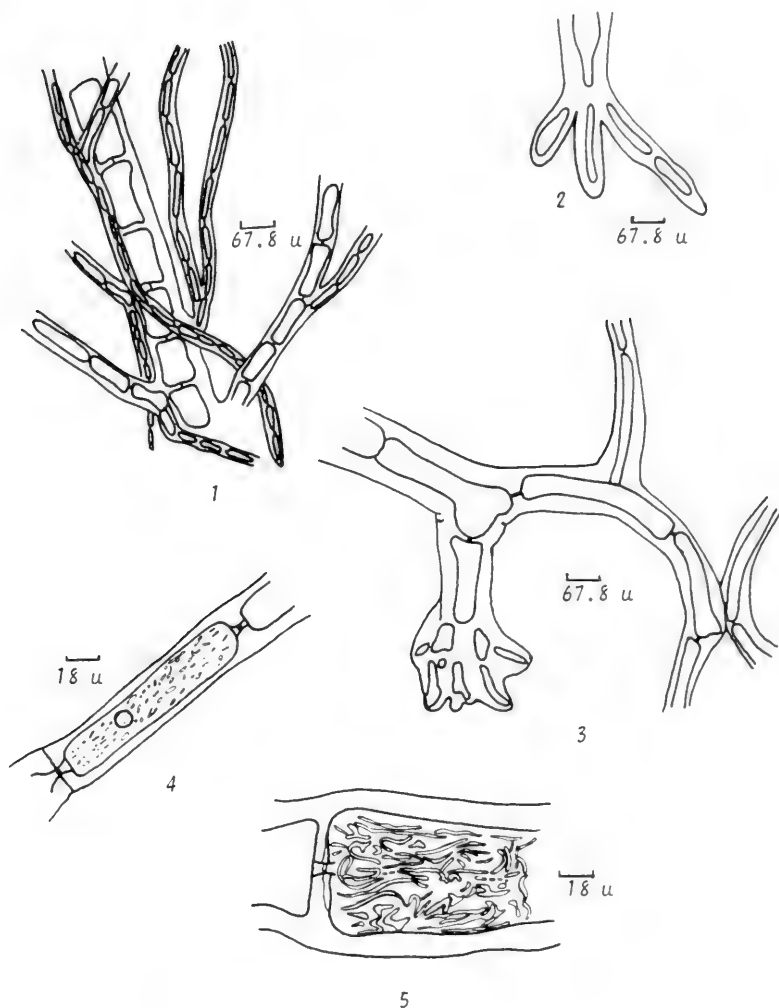
Los talos tetraesporofíticos tienen los tetraesporocistos sésiles en las ramas y ramillas superiores. están divididos tetraedricamente, son de forma casi esférica y se desarrollan en el lado interno de la rama, miden 54-67 micras de diámetro, (figs. 16 y 17).

Este es el primer reporte de la especie para México.

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LAMINA 1

Aglaothamnion neglectum

- Fig. 1 Corticación cerca de la base.
 Fig. 2 y 3. Rizoides pluricelulares.
 Fig. 4 Célula vegetativa uninucleada.
 Fig. 5 Célula mostrando los plastos.

LAMINA II.

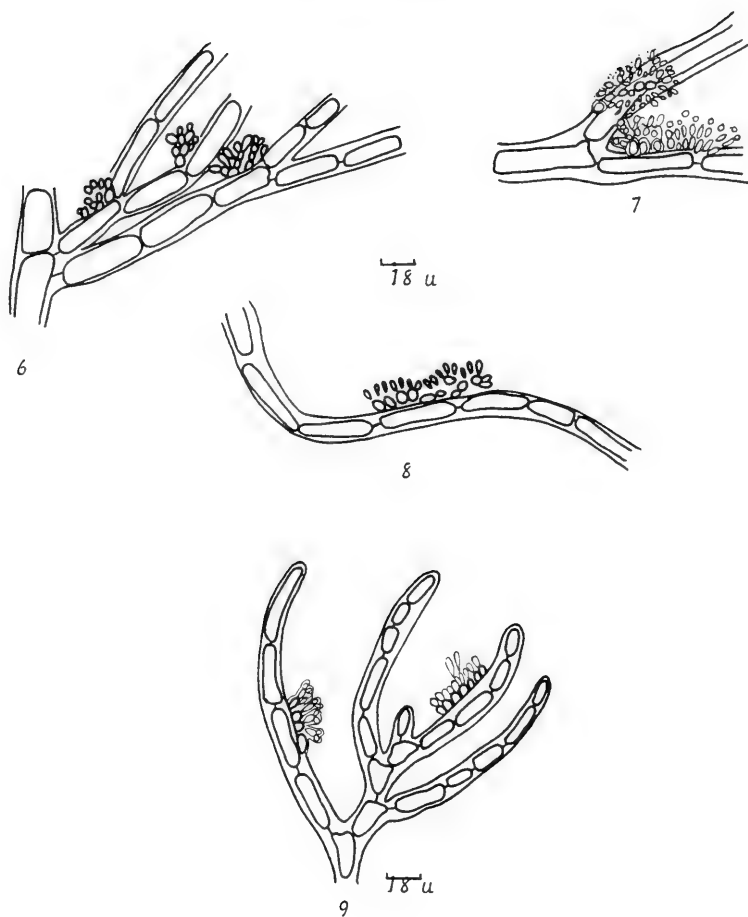
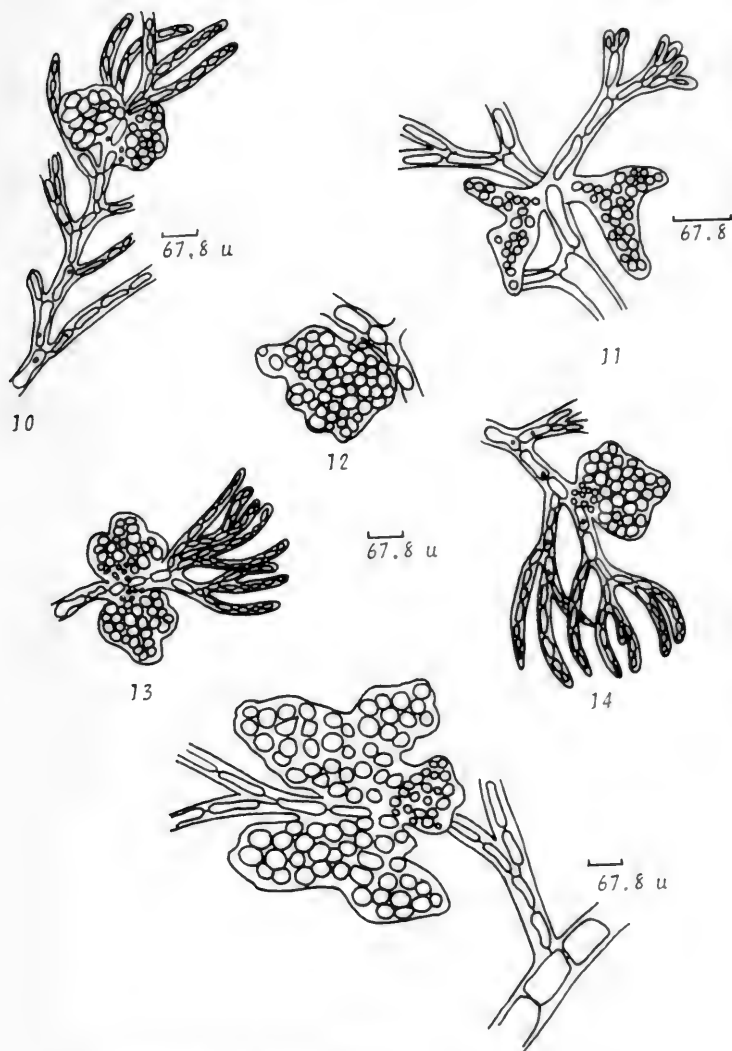
*Aglaothamnion neglectum*

Fig. 6 - 9 Ramas con espermatocistos y espermatites.

LAMINA III.

Aglaothamnion neglectum

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Fig. 10 - 15. Ramillas con diferente desarrollo de gonimoblastos.

LAMINA IV.

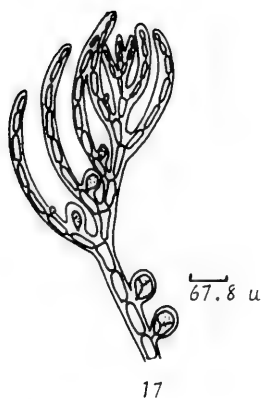
*Aglaothamnion neglectum*

Fig. 16-17 Ramas terminales con tetrasporocistos
Todas las figuras originales.

ALGAS MARINAS POCO COMUNES DE LA FLORA MEXICANA - IV-

CROVANIA ATTENUATA (BONNEMAISON) J. AGARDH (RHODOPHYCOPHYTA.-
FAM: CERAMIAEAE).

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Planta erecta, color rosa rojo-vino, desde 1 hasta 8.5 cm. de alto, de forma irregular, al tacto gelatinosa lúbrica poco o nada calcificada. Fija al substrato por rizoides.

La planta está formada por un eje central monosifónico de células grandes 2 ó 3 veces más largas que anchas de crecimiento indefinido, cubiertas por verticilos de ramillas de crecimiento definido que nacen en número de 3 a una altura de $\frac{3}{4}$ del alto de la célula central que les da origen. Las ramas secundarias de crecimiento indefinido nacen en las células del cilindro central en substitución de una de las ramillas del verticilo.

Las células del eje, en la parte media de la planta, miden -- 300 a 400 μ de largo por 80 a 90 μ . de grueso. Cerca de la base el pedúnculo tiene de 500 a 580 μ . de diámetro. En cada verticilo tres ramilletes, cada uno de ellos con una célula basal y ramas hasta de 5° orden, a veces hasta de 7° orden, divididas -- tricotómicamente, las células terminales a veces son 4. La célula basal de 30 μ de alto por 10 a 15 μ de diámetro, las siguientes de 2° y 3er. orden más delgadas y más altas, pero las de 4° y 5° orden más pequeñas, las últimas a veces largas y cilíndricas, otras cortas y romas, pero más comunmente cortas y acuminadas.

Tetraesporangios escasos, en una plantita de numerosas ramillas, sólo dos con tetraesporas y estas casi siempre una sola por ramillete y por verticilo, alternando algunos verticilos -- estériles, ocasionalmente más abundantes de 2 en el mismo verticilo pero en diferente ramillete. Tetraesporangios de división cruzada a tetraedrica, con una cápsula muy gruesa, de 50 a 60 μ . de diámetro, que nacen en la cima de la célula basal de un ramillete.

Carpoesporofitos en forma de mócula, pequeños de 30. μ escasos diseminados en la rama y uno por verticilo.

Según Madame Genevieve Feldmann-Masoyer, en la parte alta de la planta, en las células terminales de los ramilletes verticilados, las células apicales dan nacimiento a las células madres de los espermaties, cada célula madre da nacimiento por gemación a dos ó tres espermaties.

Se encontró una planta alta de 8.5 cm de longitud, por lo que podría pensarse en C. pleonospora, pero en las medidas de sus -

ejes, sus células centrales y de sus ramilletes queda con *C. - attenuata*. Se han observado numerosos ejemplares, la mayoría - presentan calcificación escasa o nula.

Parece que cuando *Crouania* está epífita en un lugar donde pasa el agua continuamente pero sin arena o limo, la calcificación es poca, pero en una mota de varias plantitas de *Crouania* que estaba asociada a *Centroceras* y se encontraban semienterradas en el limo, la calcificación es mucho mayor, probablemente el mucílago que incluye a toda la planta retiene las partículas del limo que llegan a ella.

Son abundantes las plantas que llegan a 4.5 cm de alto, pero es mucho mayor el número de plantas pequeñas.

Otra característica que menciona W.R. Taylor para *C. pleonospora* es que las ramas secundarias además de adelgazarse hacia la cima, lo hacen hacia la base. En nuestro material todas las plantitas presentan ese carácter, por lo que se cree que no es exclusivo para *C. pleonospora*.

Se considera que la planta de altura mayor a la normal puede deberse a condiciones ecológicas favorables, pues excluyendo - las medidas mayores que presenta Taylor para *C. pleonospora*, - los demás caracteres que son: poca calcificación, ramas secundarias adelgazadas hacia la base y tetraesporas mas abundantes, son comunes en la *C. attenuata* presente en nuestra región.

La encontramos en Cayo Norte, Banco Chinchorro, Quintana Roo, el 27 -VI- 1984., Isla Cozumel, Quintana Roo en IX-1985 y en Cayo Arcas, Campeche, 23-IV-1986.

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LAMINA 1

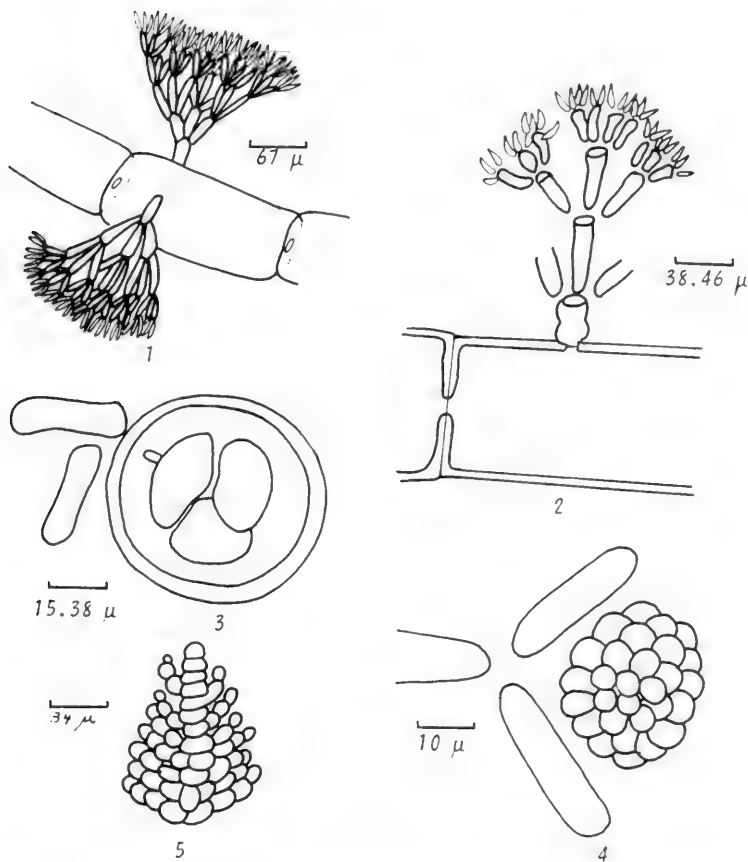
*Crowania attenuata*

Fig. 1 y 2 Posición de las ramillas; Fig. 3.- tetrasporocisto
Fig. 4 gonimoblasto; Fig. 5 ápice de las ramas de crecimiento
indefinido.

Todos los dibujos originales.

A NEW COMBINATION IN PASSIFLORACEAE

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As a result of a revision of the species of *Passiflora* with uncinata trichomes (Doctoral Dissertation, Duke University), the following transfer is necessary.

PASSIFLORA LOBATA (Killip) Hutch. ex J. MacDougal, comb. nov.

Tetrastylis lobata Killip, J. Wash. Acad. Sci. 16:368. 1926.

--TYPE: Costa Rica, San José, La Hondura, 1200-1500 m, 9 Mar 1926, Standley & Valerio 51917 (holotype: US!; photograph of holotype: DUKE!, MEXU!; isotypes: NY!, US!; photograph of isotype at US: DUKE!).

Passiflora pediculata auct. non Mast.: Woodson & Schery, as to specimen cited and description in part, Ann. Missouri Bot. Gard. 45:12 [Flora of Panama]. 1958.

Passiflora tetrastylus Denno & Donnelly, Ecol. Entomology 6: 11. 1981. Nom. nudum, sphalma pro P. lobata.

In transferring this species from the genus Tetrastylis Barb. Rodr. to Passiflora L. I acknowledge the suggestion, and perhaps intention, to do so by Professor Hutchinson in his monumental work on the genera of flowering plants (1967). Though he made the new combination in his key to the genera of Passifloraceae, he failed to make direct reference to the basionym. Hutchinson did, however, recognize a monotypic genus Tetrastylis, correctly pointing out that when Killip added P. lobata to the genus (see discussion in Killip 1926) he created an unnatural group. Presting (1965) presented palynological evidence for the biphyletic nature of Killip's circumscription, and S. Tillet (in Benson et al. 1975) correctly associated the species with P. adenopoda DC. and P. warmingii Mast. [= P. morifolia Mast.]. Tillet reiterated the biphyletic nature of the genus Tetrastylis as delineated by Killip.

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ORIGIN OF THE EDIBLE BICOLOR-FRUITED CULTIVARS OF CUCURBITA PEPO

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Bicolor-fruited cultivars of Cucurbita pepo L. are those with fruit rinds containing regions which are yellow or orange and green or black, the borders of which regions are sharp and distinct. The yellow/orange regions and the green/black regions are visible as distinct yellow and as distinct green regions, respectively, of the ovary from long before anthesis. The distribution of yellow is generally toward the equatorial regions and the distribution of green toward the polar regions in bicolor fruits.

The bicolor characteristic is conditioned by alleles at the B locus other than the wild-type allele for completely green ovaries, B+ (Shifriss, 1981). When homozygous, the B allele causes the ovary to be completely yellow from long before anthesis, or "precocious yellow". When heterozygous, this allele conditions either yellow or bicolor ovaries, depending on the presence or absence of genes extending the yellow-colored region (Shifriss and Paris, 1981). Other "weaker" alleles of B result in less extension of yellow, and thus, bicolor ovaries and fruits.

Cultivars and breeding lines having precociously yellow ovaries have become more numerous since the introduction of the first cultivar to carry the B allele, Golden Zucchini, in 1973. All of these cultivars can be traced to the stabilization of B in the ornamental cultivar Bicolor Pear by O. Shifriss and subsequent transfer of B to edible cultivars by himself and his students (Shifriss, 1965, 1981). However, these modern cultivars were preceded by the no longer extant and almost forgotten edible bicolor cultivars of 100 years ago, cultivars which were not directly involved with the development of the present-day edible cultivars carrying the B allele. My aim here is to review the descriptions of these obsolete cultivars, discuss how they probably differed from modern cultivars at the B locus, and offer a suggestion concerning their origin.

The most prominent of these cultivars was Cocoanut. As pointed out by Tapley et al. (1937), this is not to be confused with another cultivar of the same name of C. maxima that was described by Burr (1863), but rather that described by Goff (1888) and Gregory (1893). In Gregory fruits of this cultivar are illustrated, and the illustration is reproduced as Figure 1. From the illustration it is clear that the fruits of this cultivar were spherical like a pumpkin but furrowed like an acorn squash, predominantly light colored but striped and mottled with a darker shade in the furrows with the polar regions of the fruit of a distinct, much darker shade. The fruits of Cocoanut were described by Gregory as follows: "In beauty it excells every other variety

of squash. The color is an admixture of cream and orange, the latter color predominantly in the depressions between the ribs, while the bottom, over a circle of two or three inches in diameter is of a rich grass-green." The illustration and description leave no doubt as to this cultivar having been bicolor. According to Tapley et al. Cocoanut was an especially long-lived cultivar, having been introduced by J.J.H. Gregory in 1869 and offered by seedsmen until 1923.

Two other cultivars of that era can be inferred to have been bicolor from the descriptions by Tapley et al. (1937). Cv. Golden Heart was described as being similar to Cocoanut but heart-shaped, golden yellow with dark green stripes along the furrows and probably derived from Cocoanut. Cv. Illinois Beauty was described by Tapley et al. as being furrowed but elongate, and "Skin color at the ends is dark green and in the center is a broad definite band of orange-yellow."

Yet another cultivar, Variegated Bush Scallop, was suggested by Shifriss (1955) to have been bicolor. This is one possible interpretation of the short description of this cultivar by Tapley et al., who refer the reader to an illustration of fruits of this cultivar in Vilmorin (1883). From more detailed descriptions by Burr (1863) and Goff (1888) and from Vilmorin's illustration it is clear that this cultivar was striped, but not bicolor. Shifriss also mentioned another scallop, called Farr's Benning White Bush. Though there is nothing in the description of this cultivar by Tapley et al. to suggest it was bicolor, Shifriss (1955) stated that it was known to him personally as being truly bicolor. Possibly, the presence of green and yellow regions of the fruits was overlooked because of the pale pigmentation of this cultivar.

The bicolor cultivars Cocoanut, Golden Heart, Illinois Beauty, and Farr's Benning White Bush probably were homozygous for a weak allele of B. If they were both homozygous and bicolor, then they almost certainly did not carry the B of modern cultivars, the B allele having full effect (Shifriss and Paris, 1981).

C. pepo is of North American origin (Trumbull, 1876; Whitaker, 1947). Forms of C. pepo appeared in European herbals relatively soon after the first voyages to the New World. Pumpkin-type forms appeared first, in the herbal of Fuchs (1542), and these soon became common garden plants in the United Kingdom (Gerard, 1597; Plat, 1660). Soon after their introduction, the pumpkins were joined by scallop-type forms and an array of ornamental gourds, warted and non-warted (Parkinson, 1640; Bauhin, 1651; Dalechamps, 1653). A bicolor form, "Cucurbita Mediocrocea", was described by Bauhin (1651) as having both green and yellow regions, the yellow situated at the medial region of the fruit and the extent of the green and yellow regions varying greatly among fruits. The fruits were in addition described as having smooth, durable, hard rinds, suggesting a form of ornamental gourd. Both warted and non-warted bicolor gourds were described in detail by Lamarck

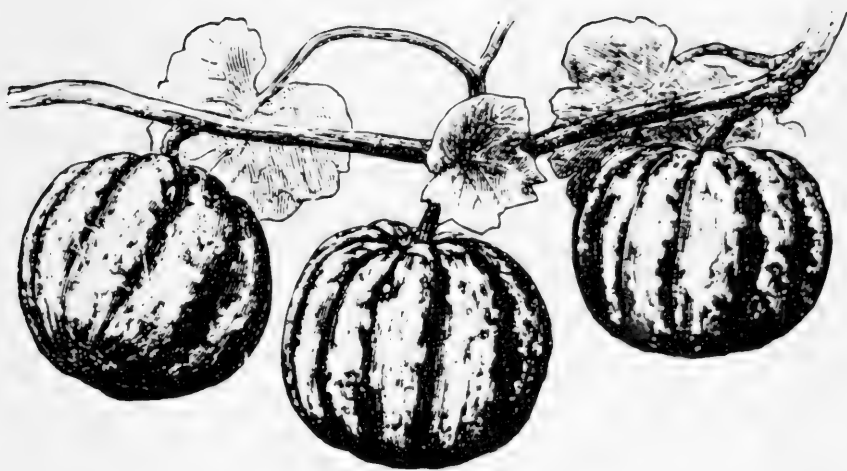


Figure 1. The Cucurbita pepo cultivar Cocoanut, reproduced from Gregory (1893).

citing Duchesne (1786). Naudin (1856) observed that the bicolor gourds were subject to what he called degeneration but nevertheless had been maintained in cultivation for a long time. Naudin (1860) illustrated two specimens of bicolor gourds, one quite similar or identical to Bicolor Pear and one somewhat more elongate. Alefeld (1866) offered the subspecific designation *C. pepo* var. *dimidiata* for the bicolor gourds but Bailey (1929) later included all ornamental gourds of *C. pepo* in var. *ovifera* Alefeld.

The ornamental gourds, *C. pepo* var. *ovifera*, are completely cross-fertile with the edible forms. It seems likely that soon after their introduction into Europe they had plenty of opportunity to cross-pollinate with edible forms, as both were commonly grown in gardens (Miller, 1732). Indeed, Shifriss (1965) has suggested that some ornamental gourd cultivars, e.g. Crown of Thorns, resulted from chance crosses between edible and ornamental forms. Some edible forms may also have resulted from such chance crosses. Cocoanut appears to have been a derivative of such a cross. Both Bicolor Pear gourd and an acorn type (top-shaped, furrowed fruits) of squash are illustrated in the same plate by Naudin (1860). The fruits of the two forms have novel characteristics, such as the distinct green and yellow regions of Bicolor Pear and the dark striping along the furrows of the acorn, which when combined could have produced fruits like those of Cocoanut. Had both Bicolor Pear and the acorn form been grown in the same garden during the same season, a definite possibility, they would have had ample opportunity to have been cross-pollinated, naturally or artificially. As this article by Naudin was published in 1860 but had been prepared by 1858, the cross-pollination probably took place in 1857. It is perhaps significant that Cocoanut was introduced into commerce a mere 12 years later, yet 12 years is an adequate amount of time for the development of a new pumpkin or squash cultivar.

Cocoanut and its allied furrowed and bicolor cultivars have been the focus of discussion here. Other, less well documented bicolor cultivars may have existed. For example, Shifriss (1965) presented a photograph of bicolor squash fruits he obtained from Mexico. The fruits were intensely pigmented and elongate, but not furrowed. In addition, he cited the red and white funerary vases of the Indians of 1500 years ago as possibly modeled after bicolor crookneck-type squash. There is also the bicolor scallop-type, Farr's Benning White Bush. Considering the great differences in fruit shape among these bicolor forms, it appears quite likely that the bicolor mutation (B+ to weak B) occurred on several occasions. It is also likely that both, the furrowed bicolor cultivars of the 19th century and the precociously yellow cultivars of the 20th century, were derived from the mutation that occurred in the ornamental cultivar Pear.

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AGROSTIS ELLIOTTIANA (GRAMINEAE)
NEW TO ARIZONA AND NEW MEXICO

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On 9 April 1986 we collected a small annual species of *Agrostis* growing in moist sand along Ash Creek on the eastern edge of the Rincon Mts., Pima County, Arizona. *Agrostis scabra* Willd., a perennial, is common along this small stream, and the little annual could easily be overlooked or mistaken for young plants of the perennial. Careful examination, however, revealed that the lemma of the annual bears from below the apex a fine flexuous awn which averages 5-7 (-8) mm in length; in *A. scabra* the lemmas are awnless, or essentially so.

We have determined this annual grass as *Agrostis Elliottiana* Schultes, which seems to be the first record from Arizona. The species was originally described as *A. arachnoides* by Elliott (Bot. S.C. & Ga., 1816) based on plants from South Carolina. Later this name was recognized to be a homonym of *A. arachnoides* Poir. (1810) by Schultes (Mantissa, 1824), who named the plant in honor of its original author.

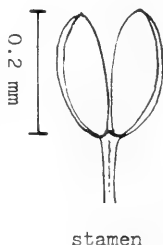
In his monograph of *Agrostis*, Hitchcock (1905) cited collections of *A. Elliottiana* from South Carolina, Georgia, Alabama, Tennessee, Illinois, Missouri, Arkansas, Mississippi, Louisiana, and Texas. It is now known from all of the Southeastern States, and is reported as having been introduced into Maine and Massachusetts, as well as Yucatan, Mexico.

Descriptions of this delicate annual are many, often quite detailed, and give a good idea of the essential characteristics of the species. Emphasis is usually directed to the open, diffuse panicle in which the slender whorled branches are naked below, branched, bearing spikelets on the outer 1/3 to 1/2. The spikelet consists of two subequal glumes 1.5-2 mm long; the conspicuously 5-nerved lemma is 1.2-1.7 (-2) mm with a slender flexuous awn up to 8 (-10) mm long borne below the tip (or rarely awnless). The awn is variously described as flexuous and "scabrous" or "delicately short pilose" (Hitchcock, 1937). Small (Flora SE United States, 1903) described it as "a very finely filiform flexuous barbellate awn." The palea is wanting or a mere scale.

Our Arizona plants fit the description in all details, and reveal yet another interesting character: the presence of only one tiny stamen (ca. 0.2 mm long). There seems to be no recognition of this character in the recent literature. In fact, generic descriptions of *Agrostis*, if the matter is stated at all, indicate stamens 3 (cf. Björkman, 1960; Philipson, 1937). If one checks earlier literature, however, he will find that Kunth (Rev. Gram., 1829) in describing the genus gives "stamina 1-3." Bentham & Hooker (Gen. Pl., 1883) cited "stamina saepius 3." Kunth (Enum. Pl., 1833)

stated for *Agrostis arachnoides* Elliott [= *A. Elliottiana*]: "anthera subunica." Trinius (1841), however, when describing the same species gives: "Stamina 3. Antherae lineares," even though in his generic description he indicates: "Stamina 1—3." A check of the 76 species enumerated in this work shows most have three stamens; only four species are said to have but one. These include *A. exarata* Trin. and *A. geminata* Trin. In fact, Trinius (Sp. Gram. Icon., 1823—1836) illustrated these two species showing a single stamen; most of the other taxa shown have three. In our examination of numerous specimens of these two species, we consistently found three stamens per spikelet. Often a solitary anther remains attached to the top of the floret after anthesis, which may explain the report of a single stamen.

The tiny stamen in our Arizona specimens is visible to one side of the small ovary with its two stigmas. Below are two typical pooid lodicules which are broadly lanceolate with no vascular traces. The stamen is unusual in that it appears to be two largely separate anthers attached to the apex of a single filament. Normally, stamens in grasses consist of a filament bearing an anther with four pollen sacs. Since each of the two apparent "anthers" of our little grass is comprised of two pollen sacs, it seems reasonable to conclude that each is a half-anther. Moreover, there is a single vascular bundle in the filament, which seems clearly to indicate that the androecium is, indeed, a single stamen. The dehiscent stamen remains within the floret at the apex of the mature caryopsis, indicating a probable cleistogamous condition.



In any treatment of *Agrostis* which includes both species, one finds *A. exigua* Thurber (1880) listed as a close relative of *A. Elliottiana*. The area in which we found our plants in Arizona is roughly midway in distance between the easternmost recorded range for *A. Elliottiana* and the localities for *A. exigua* in California. It seemed prudent, therefore, to consider that our plants might represent this latter taxon, or alternatively that the two species could be synonyms. In checking Thurber's original description of *A. exigua* we noted with considerable interest: "...upper palet not manifest or a mere scale; stamens 1(?)." His description is ample, but did not appear to be greatly different from those we had found for *A. Elliottiana*. Thurber's description clearly states: "Paniccle half the length of the plant, included and at first narrow, at length open ..." The illustration in Hitchcock (1905) and in Hitchcock's Manual (1951) is of a small apparently immature plant with a narrow, contracted panicle! In the 1905 study, he separates the two species in a very simplistic fashion:

"Awn straight. California.

9. *exigua*

Awn flexuous. Southeastern States. 10. *elliottiana*."

In this same treatise, he quoted the entire original description of

A. exigua, but did add some further notes. At the time (1905) the species was represented only by the type (*Bolander s.n.*). Hitchcock commented: "It is unusual to have a species so rare as is indicated by a single collection in a region so well known as California, and I suspect that the species is either introduced or occurs farther to the south in Mexico or Central America, the species of which region are not sufficiently well known." In the same work, Hitchcock added this note: "Mr. Thurber at first referred this to *A. elliottiana*, which it resembles in habit. But it differs from that species in having the flowering glumes as long as the empty glumes, the lobes extending into two awned teeth, and in the stouter straight awn. The empty glumes are only slightly acute, 1.5 mm long, equal, slightly scabrous on back. Awn scabrous, straight, 5—6 mm long."

In order to determine the validity of the differences stated above, we borrowed all of the specimens of *Agrostis exigua* from UC. There were only eight, all from California. In comparing these specimens with material of *A. elliottiana* at ARIZ, which represented collections from Virginia to Oklahoma and eastern Texas, we could find no differences to suggest that more than one taxon is represented.

The length of lemma to glumes varies from plant to plant. In some, the lemma appears to be about as long as the glume, whereas in others the lemmas are slightly shorter. This difference is not confined to plants from any specific geographic area; both conditions were observed among the California plants as well as those from the Southeast. No significant differences in conformation nor indument were detected. The length of setae at the apex of the lemma varies within the same collection. Mostly they are 0—0.1—0.2 mm, but rarely attain a length of 0.3—0.4 mm. They are usually quite inconspicuous, and often can be detected only under high magnification. Although prominent setae have been used as a character to distinguish *Agrostis exigua* from *A. elliottiana*, we did not find this feature to be dependable. In some of the California collections, the longest setae scarcely attain a length of 0.1 mm, while setae 0.2 mm long were observed in plants from Louisiana and eastern Texas. Whereas lemma setae appear to average slightly longer on the California plants, we did not find presence or absence of setae to have any validity in segregating these taxa.

In both the Southeastern and California collections, the panicle consists of about half the plant height, with capillary branches which divide and bear spikelets on the outer 1/3 to 1/2. In Hitchcock's Manual (1951), *Agrostis exigua* is described as a delicate annual 3—10 cm tall. Hoover 5872 (UC) from Shasta County, CA, consists of seven plants all with open panicles. The largest specimen is 45 cm tall, and the lowest panicle branches measure as much as 7.5 cm in length! The plants comprising Tracy 18671 (UC) from Napa County, are rather similar to the above with a maximum height of 23 cm.

Although the awn of *Agrostis Elliottiana* is described in the literature as slender and flexuous, that of *A. exigua* is said to be "straight" (Hitchcock, 1937) in the key and "straight or flexuous" in the text! In the 1951 Hitchcock's Manual *A. exigua* is keyed with the brief statement: "Awn geniculate; Pacific Coast." In the same publication the awn of *A. Elliottiana* is described as "...very slender, flexuous, delicately short pilose, 5—10 mm long." Among the California specimens examined, we did note that awns tended to be slightly less slender and delicate than those from the Southeast. Perhaps because they are less "threadlike," they may appear to be somewhat straight rather than prominently sinuous. Numerous awns on the "*A. exigua*" specimens are flexuous, however, and as noted above, Hitchcock (1937) described them as "straight or flexuous." Moreover, Hoover noted on the label of his #2261 from Tehama County, CA: "awn... delicate, straight or flexuous (not geniculate)." In view of the fact that awnless forms of *Agrostis Elliottiana* occur, the slight awn differences mentioned above are probably of minor taxonomic significance. We found the awns of both "species" to have rather widely spaced longer than usual spicules (or 'prickle hairs' sensu Metcalfe). With a hand lens these spicules may give the appearance of short hairs, but under high magnification they are clearly somewhat elongated spicules.

The presence of one stamen within the floret is obviously a crucial character, if these "species" are indeed the same. The California specimens all proved to have a single stamen, as had been suggested by Thurber in his original description. It is identical to those we found in the Arizona plants and in material from the Southeastern United States.

In 1825 Rafinesque (Neogenyt. 4) proposed the genus *Notonema*, based on *Agrostis arachnoides* Elliott [= *A. Elliottiana*], citing the presence of a single stamen as sufficient reason to segregate it as a monotypic genus. In 1830 (Seringe Bull. Bot. 1: 220) he described the genus, which was only a nom. nud. in the 1825 publication. (Cf. Merrill, E. D. 1949. Index Rafinesquianus. p. 76). However, the transfer of the specific epithet was not published until Jackson included it in Index Kewensis 2: 319. 1894: *Notonema arachnoides* (Elliott) Raf. ex Jackson. No one since that time has adopted Rafinesque's genus probably because these plants so closely resemble such undisputed members of *Agrostis* as *A. hyemalis* (Walt.) B.S.P. and/or *A. scabra* Willd. This is especially true for the rather rare awnless form of *A. Elliottiana*. Gleason (in Britton & Brown, 1952) has added this note to the *A. Elliottiana* description: "Awnless forms, rarely seen in our range, may be distinguished from *A. hyemalis* by the proportionately larger panicle and sharply nerved lemma and the annual habit." Two years later Shinners (Rhodora 56: 28. 1954) published forma *molesta* for the awnless plants and commented on the difficulty of separating them from *A. hyemalis*. To the differences enumerated by Gleason, we would add that in *A. Elliottiana* the capillary panicle branches are minutely scaberulous, and there is only one tiny stamen per floret.

While in the process of studying our Arizona collections, we received a specimen from R. D. Worthington (UTEP). His material from westernmost New Mexico had been identified as *Agrostis exigua* by Stephan Hatch (TAES), and verified by botanists at UC. We found the Worthington specimen (new to New Mexico) in general to be a good match for our Arizona collections. One difference is that some lemmas of the New Mexico plants have unusually long setae (up to 0.4 mm). In the same inflorescence, however, one can find lemmas with setae 0.25 mm or less. It is noteworthy, we believe, that in our Arizona material, collected some 160 km farther west, and thus nearer to the "homeland" of *A. exigua*, the maximum length of lemma setae is 0.2 mm, whereas on many of the lemmas setae appear to be lacking or are less than 0.1 mm long. Another almost imperceptible difference is that the awns on the New Mexico plants seem to be slightly more delicate and, perforce, a bit more flexuous than is the case with our Arizona gatherings.

For cytological studies, we fixed young inflorescences from populations of our 7830 and 7841 in the field in the standard 3:1 absolute ethyl alcohol: acetic acid mixture. Because the anthers are so tiny (only 0.2 mm when mature) it is essentially impossible to prepare squashes in the usual manner. We resorted to using entire flowers, often with a bit of lemma attached. This species appears to be diploid with $2n = 14$ chromosomes. Seven pairs were observed in dividing PMC's, and we also counted 14 somatic chromosomes in mitotic divisions in the stigma. As nearly as we have been able to determine, this is a first count for *Agrostis Elliottiana*. We found no report in the literature for either this species or *A. exigua*.

Under close scrutiny, we find the supposed differences between these two "species" to be more apparent than real. Our conclusion, therefore, is that a more realistic taxonomy results when *Agrostis exigua* is treated as a synonym of *A. Elliottiana*. The Arizona and New Mexico collections reported here, which are new records for these states, serve to bridge the gap, both morphologically and geographically, between the eastern and western populations, and extend the range of *A. Elliottiana* from coast to coast in the USA.

Agrostis Elliottiana Schultes, Mantissa 2: 202. 1824. Based on *A. arachnoides* Elliott.

Agrostis arachnoides Elliott, Bot. S.C. & Ga. 1: 134. 1816; non Poir. 1810. Type: South Carolina, Orangeburg. Bennett.

Agrostis exigua Thurber in S. Watson, Bot. Calif. 2: 275. 1880. Type: California, foothills of Sierras, Bolander s.n.

Notonema arachnoides Raf. (Neogenyt. 4. 1825) ex Jackson, Index Kew. 2: 319. 1894. Based on *Agrostis arachnoides* Elliott.

Notonema agrostoides Raf. ex Merrill, Index Rafinesq. 76. 1949. Error for *N. arachnoides*.

Agrostis Elliottiana Schultes forma *molesta* Shinnars, Rhodora 56: 28. 1954. [for the awnless form.] Type: Texas, Wood Co., Mineola, Shinnars 14372.

SPECIMENS EXAMINED

VIRGINIA: Aurora Hills, Alexandria, Swallen & Hotchkiss, *Amer. Gr. Nat. Herb.* 1546 (ARIZ-2 sheets). **SOUTH CAROLINA:** Lancaster Co., Forty Acre Rock, Leonard & Radford 1379 (ARIZ). [This collection has awned and awnless plants of *A. Elliottiana*, along with several immature specimens of young *A. hyemalis* (Walt.) B.S.P.]. **LOUISIANA:** Morehouse Parish, Bayou Bartholomew, west of Jones, R. D. Thomas 18293 (ARIZ). **OKLAHOMA:** Muskogee Co., east of Bragg, L. W. Myers 65 (ARIZ); Norman, Golf Links, C. W. Prier s.n. (ARIZ-84315). **TEXAS:** Dallas Co., near Seagoville, Lundell & Lundell 10396 (ARIZ). [determined originally as *A. hyemalis* (Walt.) B.S.P.]; Brazos Co., Range Science Area, Texas A & M University, J. Valdez R. s.n. (ARIZ-249970). **NEW MEXICO:** Hidalgo Co., Peloncillo Mts., Cloverdale Creek Canyon, R. D. Worthington 14015 (ARIZ). **ARIZONA:** Pima Co., Rincon Mts., Ash Creek, Reeder & Reeder 7830, 7842, 7849 (ARIZ). **CALIFORNIA:** Shasta Co., Redding, J. W. Blankenship s.n. (JEPS-68390); 7 miles N of Redding, R. F. Hoover 5872 (UC). Tehama Co., 4 miles S of Cottonwood, R. F. Hoover 2261 (UC). Amador Co., S of Ione, H. S. Yates 5138 (UC). Napa Co., Howell Mt., E of Angwin's, J. P. Tracy 1552 (UC), 12109 (UC); La Jota Plateau, head of Moore's Creek, E of Angwin's, J. P. Tracy 12462 (UC), 18671 (UC).

ACKNOWLEDGMENTS

We are grateful to the Curators at UC for the loan of specimens; to R. D. Worthington (UTEP), who provided us with a specimen of his New Mexico collection and generously indicated willingness for us to include it in our report; and to Charles T. Mason, Curator at ARIZ, who arranged for loan material and provided space and facilities for our studies.

IMPORTANT GENERAL LITERATURE

- Björkman, S. O. 1960. Studies in *Agrostis* and related genera. *Symb. Bot. Upsal.* 17: 1—112.
- Hitchcock, A. S. 1905. North American species of *Agrostis*. U.S. Dept. Agric. Bur. Plant Industry Bull. 68.
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1937. *Agrostis* L. North Amer. Flora 17(7): 515—534.
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1951. Manual of the Grasses of the United States. (2nd ed. Revised by Agnes Chase) U.S. Dept. Agric. Misc. Publ. 200. 1051 pp.
- Philipson, W. R. 1937. A revision of the British species of the genus *Agrostis*. *Jour. Linn. Soc. Bot. (London)* 51: 73—151.
- Trinius, C. B. 1841. Gramina Agrostidea. II Callo Rotundo. (*Agrostea*). *Mém. Acad. St. Pétersb. Sci. Nat.* VI. 6(2): 1—144. (Reprint 42).

Penstemon penlandii, spec. nov. (SCR) from Colorado

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Middle Park is one of a series of high altitude mountain valleys between the Front Range and the Northern Gore Range of the Rocky Mountains in Colorado. Its county seat is Kremmling, and the Colorado River arises here in Grand Lake. The area of the Park north of the Colorado River is arid, a region of seleniferous clay soils. A small amount of local endemism in the Flora occurs, the most notable species in this pattern being *Astragalus osterhoutii* M. E. Jones which is confined to selenium soils in the Park. *Physaria osterhoutii* Payson, is also endemic here. *P. harringtonii* Penland ranges from Middle Park slightly westward through the Colorado River canyon to the junction of the Eagle and Colorado rivers.

This paper describes a new species of *Penstemon*, Sect. *Glabri* (Rydberg) Pennell which is apparently endemic to a small part of the area occupied by the narrowly endemic *Astragalus osterhoutii*.

Penstemon penlandii is an obligate selenophile most closely related to *P. paysoniorum* Keck of southwestern Wyoming, a species also restricted to seleniferous shales. It differs from the latter by having retrorsely puberulent, rather than glabrous, stems and foliage, linear, rather than oblanceolate, leaves, and a smaller corolla (less than 15 mm long). The staminode in each species is truncate and sparsely bearded distally with pale yellow trichomes. The shape of the staminode and the relative density of the beard is generally glossed over in descriptions, but there may well be important points of coincidence and difference if the feature were given systematic study over the group. *Penstemon aridus* Rydberg, of Montana and northern Wyoming, bears a superficial resemblance to *P. penlandii* but there the corolla is glandular-pubescent and bearded within, and the pollen sacs are glabrous, dehiscent throughout and explanate.

***Penstemon penlandii* W. A. Weber, sp. nov.**

Penstemon paysoniorum sect. *Glabri* similis sed caulibus retrorso-puberulis, folia linearibus 1.0-1.5 mm longibus, corolla minus quam 15 mm longa.

Perennial herb from a loosely branched woody caudex arising from a short rhizome provided with long ropy unbranched roots. Vegetative branches few and short, crowned by tufts of leaves similar to the basal ones of flowering shoots. Flowering stems erect, up to 2.5 dm tall; stems and at least the lower parts of the

leaves retrorse-puberulent with minute eglandular (and glandular?) trichomes; basal leaves erect, entire, linear, involute, 1-1.5 mm wide; cauline leaves somewhat reduced, ascending. Inflorescence narrow, secund, up to 5 cm long, 5-15-flowered, in few-flowered cymes; axis, peduncles and calyces glabrescent; calyx 4-5 mm long, the sepals ovate, acute, the margins broadly scarious and erose-dentate. Corolla blue-violet, 12-15 mm long, tubular, gradually widened to the lobes, hardly 2-lipped, glabrous externally and internally, 5 mm wide at apex, not 2-ridged ventrally, the lobes as broad as long, 3 mm diam, overlapping the sinuses. Stamens and staminode included; staminode wider and truncate at the apex, sparsely bearded ventrally on distal third with pale orange hairs; anthers of fertile stamens moderately hairy with short, stiff trichomes; anther sacs 1.0-1.2 mm long, almost parallel at dehiscence but becoming explanate, dehiscing the full length but not across the connective, the sutures papillate-denticulate; capsule ovoid-conic, 12-14 mm long; seeds oblong-cuboidal, 3.5-3.7 x 1.5 mm, quadrangular, the dorsal face convex, the sides plane to concave, margins thin-edged.

HOLOTYPE: Colorado: Grand County. Middle Park, 3.8 miles north of Colorado River along Troublesome Creek road above east bank of the creek on strongly odoriferous selenium clay knolls, 2,440 msm, T. 2 N., R. 29 W, Sec. 30, 30 July 1986, *Weber & Dahnke* 17230 (COLO). Isotypes, mostly in fruit, have been distributed to the following herbaria: BRY, GH, KANU, MO, NMC, NY, TEX, UC, US, UTC, WY.

This species is dedicated to Dr. C. William T. Penland, (1899-1982), professor at Colorado College who had a life-long interest in the Colorado Flora, especially *Penstemon*, and who contributed the treatment of the genus for Harrington's *Flora of Colorado*.

Penstemon penlandii was discovered by David L. Johnson, Western Resource Development Co., on a survey for the relocation of a high power line. The type material, consisting of flowering and fruiting plants, was collected two weeks later by the authors.

At the type locality *Penstemon penlandii* showed a distinct preference for relatively barren slopes. The most luxuriant plants were those growing from seed washed down the slopes by torrents, germinating in deep runoff channels in the shade afforded by the cut-banks. The development of relatively few stems from a well-developed but short rhizome suggests that the function of the rhizome is not so much to furnish nodes for the production of adjacent clumps (several clumps are only rarely found together and then not connected by rhizomes) but to give the plant some stability against dislodgement by torrential rains. *P. paysoniorum* shares this attribute.

The population is limited to strongly seleniferous clay-shales. These extend for about two miles along and above the east side of the road. Where erosion mixes the seleniferous substrate with less toxic material from above, the flora becomes dominated by sagebrush and large mats of *Penstemon caespitosus*, *Townsendia leptotes*, and *Penstemon penlandii* disappears. The tops of the knolls tend to be better vegetated with matformers, especially *Lesquerella alpina* ssp. *parvula*. From a distance one can predict the occurrence of the *Penstemon* by noting the presence of *Aletes megarrhiza* on the slopes. This proved to be an infallible way of finding *Penstemon* stands, at least at the type locality.

In order to determine whether the coexistence of the two species was real or coincidental, a search was made of a very large *Aletes* stand four miles south of Kremmling across the Colorado River. That, however, was on a darker, less seleniferous shale, and there the *Penstemon* was not found. So despite their apparent fidelity to each other in one site, the absence of *Penstemon* on the second area suggests that the two species indeed have different requirements or tolerances.

The distribution of two other selenium soil species abundant in the Park presents a phytogeographical anomaly. Both *Townsendia leptotes* (Gray) Osterh. and *Lesquerella alpina* ssp. *parvula* (Greene) Rollins & Shaw are abundant on these substrates at 2,400 meters but are altitudinally disjunct to limestone substrates on high alpine peaks at over 3,600 meters. A similar distributional anomaly involves *Townsendia rothrockii* A. Gray ex Rothrock, which characteristically is a snowbed plant in the alpine tundra but reappears in openings of *Pinus ponderosa* forests at less than 3,000 meters on the Uncompahgre Plateau. The low dense mat growth form of these taxa probably has adaptive value for their occurrence in these disparate habitats. *Penstemon penlandii* does not share their growth form, however, and should not be expected to recur in the alpine.

NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). XXII

Harold N. Moldenke

CLERODENDRUM Burm.

Additional & emended bibliography: Baill., Hist. Pl. 11: 86--88. 92, 94, 95, 112, & 114--116, fig. 98--100. 1891; Mullan, Journ Indian Bot. Soc. 12: 165--182, fig. 184--197. 1931; Ramakrishnan, Proc. Indian Acad. Sci. B.34: 163. 1951; Eyster, Biol. Abstr. 26: 1184 & 3141. 1952; Ramakrishnan, Proc. Indian Acad. Sci. B.35: 112. 1952; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): [Fl. Peru] 697--700. 1959; Mold., Phytologia 60: 352--368. 1986.

CLERODENDRUM DENTICULATUM Mold.

Additional bibliography: Mold., Phytologia 59: 251--252 (1986) and 60: 131. 1986.

A key to distinguish this species from other Cuban species will be found under *C. grandiflorum* (Hook.) Schau. in the present series of notes (60: 131).

CLERODENDRUM DEPENDENS A. DC.

Additional bibliography: Mold., Phytologia 59: 252. 1986.

A key to help distinguish this species from other Madagascar species will be found under *C. baronianum* Oliv. in the present series of notes (58: 184).

CLERODENDRUM DISCOLOR (Klotzsch) Vatke

Additional synonymy: *Siphonanthus* (*Cyclonema*) *discolor* (Kl.) Hiern, Cat. Afr. Pl. Coll. Welw. 1: 847 in textu. 1900.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 59: 248, 255--268, 325, 333, & 492 (1986) and 60: 59, 193, & 275. 1986.

CLERODENDRUM DISCOLOR var. *MACROCALYX* Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 59: 264. 1986.

CLERODENDRUM DISCOLOR var. *RUBRICALYX* Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 1471. 1952; Mold., Phytologia 59: 268. 1986.

CLERODENDRUM DISPARIFOLIUM Blume

Additional bibliography: Hayata, Journ. Coll. Sci. Tokyo 30: 217. 1911; Backer, Tropische Natuur 5: 91--93. 1916; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 74, 80, 83--84, & viii. 1921; Burkill, Dicr. Econ. Prod. Malay Penins., imp. 1, 1: 591. 1935; H. N. & A. L. Mold., Pl. Life 2: 65. 1948; Burkill, Dict. Econ. Prod. Malay Penins., imp. 2, 1: 591. 1965; Mold., Phytologia 59: 325--332, 344, 409, 481, & 482 (1986) and 60: 136, 140, 267, & 368. 1986.

A key to help distinguish this species from other Thailand taxa will be found under *C. inerme* (L.) Gaertn. in the present series of notes.

An additional vernacular name reported for *C. disparifolium* is "ki bangbara".

CLERODENDRUM DUSENII Gürke

Additional bibliography: Mold., Phytologia 59: 333--335 & 492 (1986) and 60: 59 & 271. 1986.

A key to distinguish this species from some of its close relatives in western tropical Africa will be found under *C. inaequipetiolatum* Good in the present series of notes.

CLERODENDRUM EBURNEUM Chiov.

Additional bibliography: Pichi-Sermolli, Biol. Abstr. 26: 642. 1952; Mold., Phytologia 59: 335. 1986.

CLERODENDRUM ELBERTI H. Hallier

Additional bibliography: Mold., Phytologia 59: 339--340 (1986) and 60: 190. 1986.

CLERODENDRUM ELEGANS Manetti

Additional synonymy: *Clerodendron elegans* "Hort. Belg. ex Lem." apud H. J. Lam, Verbenac. Malay. Arch. 363. 1919.

Additional bibliography: Mold., Phytologia 59: 340--341. 1986.

CLERODENDRUM EMIRNENSE Bojer

Additional bibliography: Mold., Phytologia 59: 344--349 & 424 (1986) and 60: 133. 1986.

CLERODENDRUM EMIRNENSE f. *DENTATUM* Mold.

Additional bibliography: Mold., Phytologia 59: 348. 1986.

A key to distinguish this plant from other Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 186).

CLERODENDRUM EMIRNENSE var. *DIFFUSUM* Mold.

Additional bibliography: Mold., Phytologia 59: 347--349. 1986.

A key to distinguish this plant from other Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 190).

CLERODENDRUM ERIOPHYLLOIDES Mold.

Additional bibliography: Mold., Phytologia 59: 350--351 (1986) and 60: 60. 1986.

CLERODENDRUM EXCAVATUM DeWild.

Additional bibliography: Mold., Phytologia 59: 355--359, 406--407, & 478. 1986.

CLERODENDRUM EXCAVATUM var. *CUNEATUM* DeWild.

Additional bibliography: Mold., *Phytologia* 59: 359 & 406--407 (1986) and 60: 361. 1986.

CLERODENDRUM FARAFANGANENSE Mold.

Additional bibliography: Mold., *Biol. Abstr.* 26: 185. 1952; Mold., *Phytologia* 59: 407--408. 1986.

CLERODENDRUM FASTIGIATUM (Hunter) H. J. Lam

Additional bibliography: Prain, *Ind. Kew. Suppl.* 5, imp. 1, 248 (1921) and imp. 2, 248. 1960; Mold., *Phytologia* 59: 409. 1986.

CLERODENDRUM FAULKNERI Mold.

Additional bibliography: Mold., *Biol. Abstr.* 26: 1471. 1952; Mold., *Phytologia* 59: 409--411. 1986.

CLERODENDRUM FILIPES Mold.

Additional bibliography: Mold., *Biol. Abstr.* 26: 185. 1952; Mold., *Phytologia* 59: 411. 1986.

CLERODENDRUM FINETII Dop in Lecomte, *Notul. Syst.* 4: 12--13. 1920.

Additional & emended bibliography: Dop in Lecomte, *Notul. Syst.* 4: 12--13. 1920; Mold., *Phytologia* 59: 412 (1986) and 60: 142. 1986.

This species is not typified by an "unnumbered" collection, as erroneously stated by me in *Phytologia* 59: 412 (1986), but actually on *Lecomte & Finet 1731* from Angkor-Thom, *1744* from Pnom-Penh, and *1762* from Sakhandal Island, Cambodia. Dop (1920) comments that the "Espèce très voisine du *Cl. Godefroyi* O. Ktze, dont elle se distingue par la dimension des feuilles et les sépales acuminés." The ovary is subglobose and the drupes black, 5 mm. long and wide, usually containing 1 or 2 pyrenes.

CLERODENDRUM FLORIBUNDUM R. Br.

Additional bibliography: Stapf, *Ind. Lond.* 6: 134. 1931; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 560 & 561 (1946) and imp. 3, 1: 560 & 561. 1960; Mold., *Phytologia* 59: 419--428 (1986) and 60: 58 & 188. 1986.

The flowers on the Clemens specimens, cited below, are badly galled, as they are also on her May 8, 1946, collection previously cited.

Additional citations: AUSTRALIA: Queensland: *M. S. Clemens s.n.* [March 17, 1946] (Or--56532), *s.n.* [May 1, 1946] (Or--56530).

CLERODENDRUM FLORIBUNDUM var. **LATIFOLIUM** F. Muell.

Additional bibliography: Mold., *Phytologia* 59: 422, 424, 427--428, & 463 (1986) and 60: 58. 1986.

Kuntze (1891) maintains that *Ovieda ovalifolia* A. L. Juss. belongs in the synonymy of *Clerodendrum inerme* (L.) Gaertn. instead of in that of *C. floribundum* var. *latifolium*, and in this he may be correct since its type is said to have come from Pondichery where the type of *C. ovatum* Poir. (now regarded as *C. inerme*) also originated.

CLERODENDRUM FORTUNATUM L.

Additional & emended bibliography: Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26: 260--262. 1890; Backer Tropische Natuur 5: 94. 1916; López-Palacios, Fl. Venez. Verb. 263. 1977; Mold., Phytologia 59: 464--471 (1986) and 60: 143, 181, & 282. 1986.

CLERODENDRUM GARRETTIANUM Craib

Additional bibliography: Mold., Phytologia 59: 481--482 (1986) and 60: 135 & 142. 1986.

Keys to help distinguish this species from other Thailand and Indian taxa will be found under *C. lnerme* (L.) Gaertn. and *C. griffithianum* C. B. Clarke 960; 135) in the present series of notes.

CLERODENDRUM GIBBOSUM Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 185. 1952; Mold., Phytologia 59: 484--485. 1986.

CLERODENDRUM GLABRATUM Gürke

Additional bibliography: Mold., Phytologia 59: 485--486, 493, & 494 (1986) and 60: 59 & 275. 1986.

CLERODENDRUM GLABRUM E. Mey.

Additional bibliography: Mold., Phytologia 59: 486--499 (1986) and 60: 56--61 & 268. 1986.

CLERODENDRUM GLABRUM var. **MINUTIFLORUM** (J. G. Baker) Fosberg

Additional bibliography: Mold., Phytologia 59: 494 & 496--499. 1986.

A key to distinguish this plant from Madagascar and Comoro Islands species will be found under *C. baronianum* Oliv. in the present series of notes (58: 189).

CLERODENDRUM GLOBOSUM Mold.

Additional bibliography: Mold., Biol. Abstr. 26: 185. 1952; Mold., Phytologia 60: 62--64. 1986

CLERODENDRUM GODEFROYI Kuntze

Additional bibliography: Mold., Phytologia 60: 65--67, 141, & 142. 1986.

CLERODENDRUM HETEROPHYLLUM (Vent.) R. Br.

Additional bibliography: Mold., Phytologia 60: 182--188 & 362. 1986.

A key to help distinguish this species from other taxa in Madagascar will be found under *C. baronianum* Oliv. in the present series of notes (58: 189).

CLERODENDRUM HETEROPHYLLUM f. **ANGUSTIFOLIUM** Mold.

Additional bibliography: Mold., Phytologia 60: 185 & 187--188. 1986.

A key to distinguish this plant from its Madagascar relatives

will be found under *C. baronianum* Oliv. in the present series of notes (58: 189).

CLERODENDRUM HIRCINUM f. DENTATUM Mold.

Additional bibliography: Mold., *Phytologia* 60: 197. 1986.

A key to distinguish this plants from other Madagascar taxa will be found under *C. baronianum* Oliv. in the present series of notes (58: 186).

CLERODENDRUM INDICUM (L.) Kuntze

Additional bibliography: J. K. Small, *Man. Southeast. Fl.* 1144. 1933; Junell, *Symb. Bot. Upsal.* 1 (4): 101, 103, 106, & 108, fig. 156. 1934; Basu, *Indian Med. Pl.*, imp. 2, 3: pl. 747. 1935; Burkill, *Dict. Econ. Prod. Malay Penins.*, imp. 1, 1: 589. 1935; Christoffersen, *Bern. Bishop Mus. Bull.* 128: 194. 1935; Dop in Lecomte, *Fl. Gén. Indochine* 4: 850 & 853--854. 1935; Kirtikar & Basu, *Indian Med. Pl.*, ed. 2, imp. 1, 1945 & 1951--1952. 1935; H. F. MacMill., *Trop. Plant. Gard.*, ed. 4, 104. 1935; Cory, *Texas Agr. Exp. Sta. Bull.* 550: 88. 1937; Alston, *Kandy Fl.* 64. 1938; Fletcher, *Kew Bull. Misc. Inf.* 1938: 405, 425, & 431. 1938; Kanjilal, Das, Kanjilal, & De, *Fl. Assam*, imp. 1, 3: 486, 492--493, & 546. 1939; Mold., *Alph. List Comm. Vern. Names* 4 & 31. 1939; Mold., *Geogr. Distrib. Avicenn.* 2--12, 21, 22, & 37. 1939; Mold., *Lilloa* 4: 329--331. 1939; Mold., *Prelim. Alph. List Inv. Names* 18--22, 32, 33, 40, & 53. 1940; L. H. & E. Z. Bailey, *Hortus Second*, imp. 1, 188. 1941; Biswas, *Indian For. Rec.*, ser. 2, 3: 41. 1941; Chopra, *Indig. Drugs Enq.* 32. 1941; Durand & Jacks., *Ind. Kew. Suppl.* 1, imp. 2, 101. 1941; Mold., *Suppl. List Comm. Vern. Names* 2--8, 14, 15, & 17--19. 1941; Worsdell, *Ind. Lond. Suppl.* 1: 238. 1941; Mold., *Alph. List Inv. Names* 16--21, 33, 34, 40, & 56. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 4, 5, 10, 12, 24--30, 33, 53--55, 57, 59, 60, 63, 64, 66, 68, 69, 72, 76, & 90. 1942; Mold. in Lundell, *Fl. Texas* 3 (1): 85--86. 1942; H. F. MacMill., *Trop. Plant. Gard.*, ed. 5, imp. 1, 104. 1943; Stehlé, *Fl. Guad.* 4: 103. 1943; Menninger, *Stuart News Jan.* 1945; Mold., *Phytologia* 2: 99. 1945; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 561 (1946) and imp. 2, 2: 386 & 916. 1946; H. F. MacMill., *Trop. Plant. Gard.*, ed. 5, imp. 2, 104. 1946; Mold., *Alph. List Cit.* 1: 18, 24, 29, 31, 34--36, 52, 53, 60, 62, 67, 70, 72, 89, 93, 105, 113, 114, 116, 118--120, 139, 140, 172, 173, 180, 196, 204, 205, 209, 211, 212, 216, 237, 249, 250, 252, 255, 265, 270, 272, 277, 286, 288, 301, 302, 317, & 323. 1946; Mold., *Alph. List Inv. Names Suppl.* 1: 6--8. 1947; H. F. MacMill., *Trop. Plant. Gard.*, ed. 5, imp. 3, 104. 1948; Mold., *Alph. List Cit.* 2: 351, 358, 408, 410, 418, 425, 428, 458, 466, 484, 486, 490, 504, 508--510, 528, 537, 544, 558, 559, 563, 572--574, 577, 582, 605, 608, 614, 618, 626, 632, & 644. 1948; Neal, *Gard. Hawaii*, ed. 1, imp. 1, 644. 1948; H. F. MacMill., *Trop. Plant. Gard.*, ed. 5, imp. 4, 104. 1949; L. H. Bailey, *Man. Cult. Pl.*, ed. 2, 845, 1051, 1105, & 1112. 1949; Mold., *Alph. List Cit.* 3: 660, 671, 706, 777, 795, 811, 822, 826, 828, 833, 835, 836, 839, 850--852, 854, 858, 866, 879, 888, 905, 924, 934, 936, 949, 951, 954, 955, & 977 (1949) and 4: 995--998, 1004, 1009, 1012, 1019,

1021, 1027, 1034, 1036, 1039, 1040, 1043, 1044, 1085, 1096, 1100, 1101, 1103, 1114, 1117, 1127--1129, 1140, 1146--1148, 1166, 1187, 1214, 1222, 1235, & 1251. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 8, 9, 18, 22, 43, 46, 47, 50--57, 66--68, 123--126, 128, 131, 136, 137, 143, 144, 146, 150, 151, 158, & 182. 1949; W. L. Phillips, Cat. Pl. Fairchild Trop. Gard. 16 & 51. 1949; Sastri, Wealth India 2 (R): 231--232. 1950; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 5, 104 (1952) and ed. 5, imp. 6, 104. 1954; Bor & Raizada, Some Beaut. Indian Climb. 143--145 & 282, fig. 90. 1954; Thorne, Amer. Midl. Nat. 52: 313. 1954; Core, Pl. Tax. 402. 1955; Hocking, Dict. Terms Pharmacog. 53. 1955; Mold. in Cheesman, Fl. Trin. Tob. 2 (4): 414--416. 1955; Mold., Verb. [Trin. Tob.] 33--34. 1955; Chopra, Nayar, & Chopra, Gloss. Indian Med. Pl. 71. 1956; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 7, 104. 1956; Mold. in Humbert, Fl. Madag. 174: 147, 159, 161--162, 266, & 267, fig. 34 (5). 1956; Navalkar, Journ. Bomb. Nat. Hist. Soc. 53: 342. 1956; R. N. Parker, For. Fl. Punjab, ed. 3, 577. 1956; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 322. 1957; Rageau, Pl. Med. Nouv.-Calé. 61. 1957; Vélez, Herb. Angiosp. Lesser Antil. 117. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14356. 1958; T. Cooke, Fl. Presid. Bomb., ed. 2, imp. 1, 2: 514. 1958; Abeywickrama, Ceyl. Journ. Sci. Biol. 2: 218. 1959; Anon., Kew Bull. Gen. Ind. 77. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 101. 1959; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): [Fl. Peru] 698. 1959; Mold., Résumé 11, 12, 23, 27, 51, 55, 56, 59--63, 75, 77, 78, 88, 155, 159--161, 165, 169, 175, 177, 179, 188, 190, 193, 194, 198, 203, 205, 207, 216, 260, 263, 264, 266, 267, 269--271, 273, 319, 320, 322, 323, 344, 392, 427, & 450. 1959; Mold., Résumé Suppl. 1: 12. 1959; Emberger in Chadeaud & Emberger, Traité Bot. 2: 831, fig. 1177. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561 (1960) and imp. 3, 2: 386 & 916. 1960; Nath, Bot. Surv. South. Shan 305. 1960; Prain, Ind. Kew. Suppl. 5, imp. 2, 62. 1960; Cave, Ind. Pl. Chromos. Numb. 2: 136. 1961; Deb, Bull. Bot. Surv. India 3: 314. 1961; Haines, Bot. Bihar Oris., ed. 2, 2: 755 & 757. 1961; Hundley & Ko in Lace, Trees Shrubs Burma, ed. 3, 203. 1961; Tiwari & Garg, Indian Journ. Pharm. 23: 77--78. 1961; Willam. & Schubert, Agr. Res. Serv. U. S. Dept. Agr. Tech. Bull. 1234: 236. 1961; Gerth van Wijk, Dict. Plantnames, imp. 2, 1: 335 (1962) and imp. 2, 2: 1517. 1962; Harler, Gard. Plains, ed. 4, 159. 1962; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 8, 104. 1962; Mold., Résumé Suppl. 3: 3, 17, 25--28, & 30 (1962) and 4: 2. 1962; Nair & Rehmann, Bull. Nat. Bot. Gard. Lucknow 76: 14 & 16. 1962; Sobti & Singh, Proc. Indian Acad. Sci. B. 54: 141 & 143. 1962; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 547 & 561. 1963; Maheshwari, Fl. Delhi 283 & 284. 1963; Malaviya, Proc. Indian Acad. Sci. B. 58: 352, 357, & 358. 1963; Mold., Dansk Bot. Arkiv 23: 89. 1963; Patil, Bull. Bot. Surv. India 5: 20. 1963; Prain, Bengal Pl., imp. 2, 2: 623 & 624. 1963; Raman & Kesavan, Sci. Cult. 29: 609--610. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 359--361, 363, 373, 375, 379, & 381, pl. 9, fig. 11 & 12. 1963; Srinivasan & Agarwal, Bull. Bot. Surv. India 5: 86. 1963; Cave, Ind. Pl. Chromos. Numb. 2: 330. 1964.

[to be continued]

NOTES ON ROSACEAE

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The following combinations under Purshia are made to allow annotation of specimens currently on loan. Studies have confirmed that Purshia is derived from Cowania and the genera are to be combined. Comprehensive supporting data will be published elsewhere.

Purshia ericifolia (Torr. ex Gray) Henrickson comb. nov.
Cowania ericifolia Torr. ex Gray, Pl. Wright. 2:106. 1853.

Purshia mexicana (D. Don) Henrickson comb. nov.
Cowania mexicana D. Don, Trans. Linn. Soc. 14:575. 1825.

Purshia plicata (D. Don in Sweet) Henrickson comb. nov.
Cowania plicata D. Don in Sweet, Brit. Fl. Gard. II. pl. 400. 1838.

Purshia stansburiana (Torr. in Stansb.) Henrickson comb. nov.
Cowania stansburiana Torr. in Stansb., Exped. Great Salt Lake 386. 1852.

Purshia subintegra (Kearney) Henrickson comb. nov.
Cowania subintegra Kearney, Madrono 7:15. 1943.

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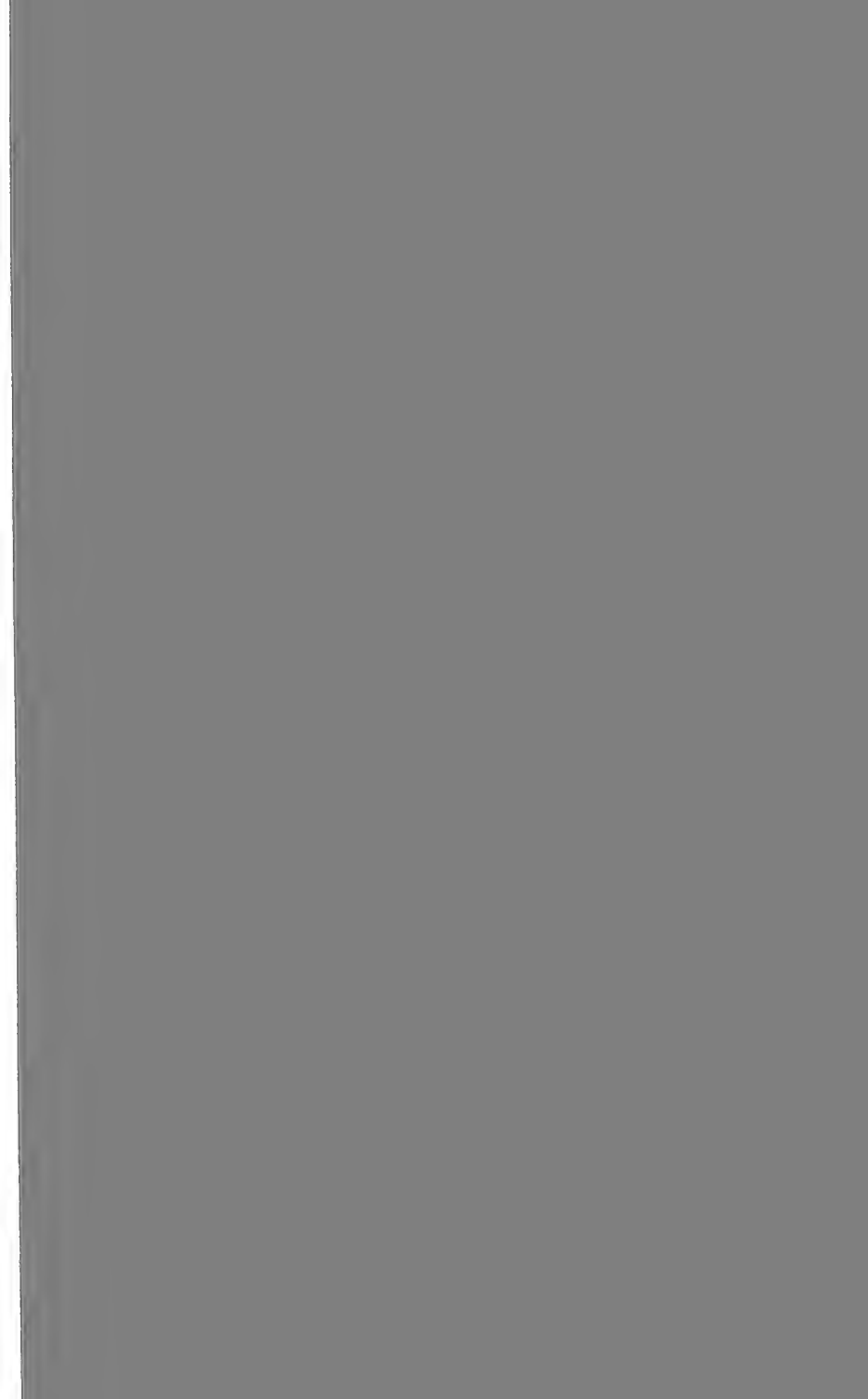
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NOTES ON THE AQUATIC HABITATS OF MACROHYDROPHYTES AND ASSOCIATED ALGAE IN VARIOUS REGIONS IN EGYPT

I. EL-FAYUM REGION

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INTRODUCTION

El-Fayum region is situated on the left bank of the Nile about 90 kilometer to the south west of Cairo. Lake Qarun lies in the north west of this region. The cultivated lands are naturally irrigated by a number of canals derived from Bahr-Yossef River, which receives its water from the Nile. The irrigation-water drains off into the lake by two main drains.

Earlier works on the algae of El-Fayum (see Aleem, 1958; El-Saadawi et al., 1978; Nosseir and Abou-El-Kheir, 1970; Shaaban et al., 1985; West, 1909) were mainly concerned with the distribution of the extinct and extant algal floras, the effect of nutrients on production...etc.

However, little is known of the relationship between algae and macrohydrophytes in Egypt; the only two publications dealing with this subject were done on lake Mariut (Kaleafah, 1964) and the Mansoura-Damietta area (Ayyad, 1980). Kaleafah, (1964) studied the ecology of algae in lake Mariut and found that Enteromorpha, Rhizoclonium, Oedogonium and Cladophora were epiphytic on Phragmites communis, Potamogeton pectinatus and Typha latifolia. While Ayyad (1980), working on water bodies in the Mansoura-Damietta area, observed that Synedra ulna var. ulna, S. ulna var. amphirhynchus, Achnanthes hungarica, A. lanceolata, Cocconeis placentula var. euglypta, C. placentula var. intermedia, Phinnularia microstaurum var. brebissonii, Nitzschia amphibia, N. thermalis, Bacillaria paradoxa, Amphora veneta, and Gomphonema angustatum var. productum from class Pinnatophyceae and only Cyclotella ocellata from class Centrophyceae were found on the surface of Ceratophyllum demersum, Potamogeton crispus, Pistia stratiotes, Nymphaea lotus and Lemna gibba.

Prowse (1959) stated that little is known about the relationship of epiphytes with their hostplants, or more particularly, whether certain species of algal epiphytes are associated with species of macrophytes. Sheldon and Charles (1975) recorded that diatoms were the dominant population of epiphytic algae in oligotrophic lake. Ewinson (1978) noticed that the increase of nutrients increased the diatom epiphytes and decreased the aquatic hydrophytes.

Some work has been done on certain aspects of relationship between algae and other plants; algal hydrophytes, lichens and algamoss-associations (see for example; Fritsch, 1959; Chapman, 1964; Prescott, 1969; El-Saadawi and Abou-El Kheir, 1973; Richardson, 1981; Abou-El Kheir et al., 1986; and El-Saadawi et al., 1986).

The present investigation deals with association aspects between algae and macrohydrophytes in different water ecosystems including flowing and standing systems and a study of the possible effects of major physical and chemical factors upon their pattern of distribution.

MATERIAL AND METHODS

Fifteen samples, used in this study, were taken from 12 sites in El-Fayum region. The samples were collected from irrigation canals, drains, springs and Lake Qarun.

Field ecological notes were recorded such as width and depth of the water channel, water current velocity, surface water temperature, and pH. Data concerning description of habitats, characters of the macrophyte communities, the main associated algal flora in the 12 studied sites, and other details are presented in table 1.

Clearing of diatoms, identification of the algal taxa associated with the aquatic plants and determination of the various nutrients in the samples were made.

RESULTS AND OBSERVATIONS

Data concerning water analysis of the 15 studied samples and algal flora identified in them are given in tables 2 and 3.

It has been noticed that, when the habitat was a narrow drain with nearly stagnant water, dominant macrophytes were Typha domingensis and Phragmites australis, and were associated with Oedogonium capilliformis as dominant, with common occurrence of planktoner Nitzschia frustulum and the blue green alga Mastigocladus laminosus.

At an irrigation canal (Maymana canal), under open running water, was noted dominance of Cladophora glomerata with epiphytic Cocconeis placentula var. intermedia.

At kaabi irrigation canal, the habitat offered a study of a striking change on the two sides of the little barrage present, with quiet water on one side, site 5a, and extremely fast-falling water from the water gates on the other side, site 5b, on the almost quiet water side dominated Potamogeton nodosus associated with the planktoner Cyclotella ocellata; while under the water fall, Cladophora glomerata dominated as epilithic to the barrage stones flooded with extremely fast flowing water. Cladophora glomerata extended as dominant in the fast flow in open water at distance from the barrage, site 5c.

A narrow drain, 5 km from El-Fayum city, with stagnant water completely covered with floating Lemna gibba fronds at surface and with Typha domingensis at sides. This lentic water habitat showed association of Oedogonium capilliformis as dominant and Spirogyra varians and Achnanthes hungarica as common.

A water spring habitat is presented by Silene spring, site 8. The habitat represents a small channel with fast flowing open water and macrophytes at bank sides. Examination has shown almost rare or lack of planktonic or benthic algal flora.

At sites 9-12, the habitat is the salty Qarun lake with Phragmites australis dominating at this southern shoreside, associated with usually rare algal flora due to high salinity; only rare new records of salinity tolerant taxa were recorded.

CONCLUDING REMARKS

Variation in algal taxa under the different studied habitats including fresh water of irrigation canals, field drains, spring water, salty lake water, has been noticed and this is dependent on various ecological factors of ecosystems: The association is brought about by similarity of ecological amplitude of certain aquatic plants and certain algae or dependence of one species of algae upon another of aquatic plants for epiphytism, protection, suitable light intensity, or formation of suitable microhabitat or substratum for the algae.

Phragmites australis has the widest ecological amplitude on all studied macrohydrophytes (see table 1). Since it is present in almost half the number of the sites. The diatoms dominate over other divisions of algae. The most common diatoms that occur in association with the studied hydrophytes are: Cocconeis placentula v. intermedia, Achnanthes hungarica, Gomphonima gracile, Nitzschia frustulum and Cyclotella ocellata Rivera (1973), Marker and Gunn (1977), Moor (1979) and Ayyad (1980) suggested that the productivity of epiphytons is dependent mainly on the growth of certain pinnate diatoms.

The number of green algal taxa was not high in almost all sites. There was an extensive growth of Cladophora glomerata, Spirgyra varians, Oedogonium Capilliformis, O. princeps and Ulothrix oscillarina. This is in agreement with Kaleafah (1964) and Ayyad (1980).

Although the number of taxa belonging to cyanophyta is larger than that of chronophyta yet not a single taxon of cyanophyta was found common only in site No. 1, which means that the water sources from which the samples were taken are not the ideal habitat for the blue-green algae. This clear especially in samples of open water where cyanophyta are rare. This in agreement with Moor (1974).

As salinity is high in lake Qarun where Phragmites australis is dominant, only rare algae were recorded. Gran (1929), Patrick (1948) and Nasr et al. (1961) pointed out that the kind and distribution of algae is greatly affected by the change of salinity of water.

Extremely fast flowing water affected algal distribution. Under such condition only such alga as Cladophora glomerata may thrive being attached to stony substratum at kaabi barrage, site 8, this is in agreement with Lund (1965), who stated that fast flowing rivers may lack a true plankton, because there is insufficient time for the algae to produce effectively.

Round (1960, 1965), noticed that Chlorophyta occur in water with high ratio of alkali/Ca+Mg. The results obtained here are in agreement with this statement, thus Cladophora glomerata and Spirogyra varians were found abundant in the present study where values of Ca and Mg were high (Table 2).

The lack of planktonic or benthic algal flora in Silene spring habitat may be explained as the source of water is the ground deep water and thus the change for algal community development becomes little for this reason and also as water flow in the channel is so fast.

Table (II): Cont.

Site No.	Date of collection	Habitat & locality	Flowing velocity	Temperature	pH	Macrohydrophyte plant community	Dominant and common algae
8	12/11/79	Silene spring channel, Silene.	1m/sec	16°C (2:10 p.m.)	7.0	Phragmites australis Echinohornia crassipes Channel side plants: Polygonum salicifolium Imperata cylindrica Conyza limifolia	d cod
9	"	Lake Qarun (saline water) southern shore. 20 Km from Fayum	Almost quiet	16°C (3 p.m.)	6.8	a: Phragmites australis Shore plants: Tamarix articulata. b: Open water	d Rare (new records) of Bacillariophyta
10	"	Lake Qarun (saline water)	almost quiet	16°C (3:10 p.m.)	6.8	Phragmites australis Shore plants: Salicornia fruticosa Avena latue, Juncus sp.	d rare
11	"	South shore Lake Qarun (saline water)	Almost quiet	16°C (3:20 p.m.)	6.8	Shore plants: Salicornia fruticosa Cyperus alternifolius	
12	"	Lake Qarun east side (saline water)	0.2 m/sec	16°C (3:30 p.m.)	6.8	Typha domingensis Shore plants: Juncus sp.	d

Table (2): Water analysis and algal flora (number of genera and species) in El-Fayum region.

Site No.	MINERALS (mg/l)							ALGAL FLORA							
	Cl	PO ₄	NO ₃	Ca	Mg	Na	K	Bacill g.	Sp.	Cyano. g.	Sp.	Chloro g.	Sp.	Euglen g.	Sp.
1	156.9	7.6	0.2	28.6	709.2	21.8	10.1	9	17	5	7	4	4	-	-
2	155.1	9.2	0.9	185.0	203.3	57.5	29.2	13	34	6	8	4	5	-	-
3	183.4	1.8	7.8	38.0	109.2	55.2	4.3	12	24	3	3	6	6	-	-
4	110.7	5.6	0.1	116.0	126.0	64.4	3.5	10	17	1	1	1	1	-	-
5a	184.5	18.2	0.2	47.8	16.2	46.0	7.8	14	37	5	5	5	5	-	-
b	184.5	18.2	0.2	47.8	16.2	46.0	7.8	12	22	8	9	6	7	-	-
c	184.5	18.2	0.2	47.8	16.2	46.0	7.8	16	25	4	4	1	1	-	-
6	137.2	10.2	1.4	12.0	348.0	39.1	29.6	14	33	-	-	1	1	-	-
7	72.1	9.2	0.6	43.8	78.6	20.7	9.4	9	20	4	4	3	4	-	-
8	325.4	2.1	1.0	42.0	12.0	39.1	11.7	2	2	2	2	-	-	-	-
9a	15620.0	3.6	5.6	1480.0	1542.0	9472.0	351.0	6	14	3	4	-	-	-	-
b	15620.0	9.2	9.8	630.0	1434.0	9782.0	195.0	5	7	2	2	1	1	1	1
10	14301.4	13.2	17.6	73.0	3204.0	1288.0	546.0	5	6	-	-	1	2	-	-
11	1301.6	7.6	0.7	210.0	210.0	149.5	35.1	14	27	5	5	1	1	-	-
12	8288.3	9.4	5.4	236.0	778.2	759.0	19.5	10	18	3	3	-	-	-	-

Table (3): Cont.

Samples No.		1	2	3	4	5a	5b	5c	6	7	8	9a	9b	10	11	12
Algal taxa																
Schizothrix arenaria (Berkeley) Gomont				r			r			r			r			
S. calcicola (Agardh) Gomont						p	r	r								
Spirulina fusiformis Woronich	p															
S. subsalsa Oersted								r								
Divisions: Chlorophyta:																
Characium acuminatum A. braun ex Kuetzing				r												
Cladophora glomerata (L.) Kütz			d				d	d	d							
C. vadorum (Areschoug) Kütz						r	r									
Chlorococcum humicolum (Naeg) Rabenh			r				r						r			r
C. infusionum (Schrank) Meneghini																
Coleochaeta divergens Pringsheim			r													
Oedogonium capilliforme Kütz	d	d	r				r			r						
O. princeps (Hass) Witttr		c	r	r						p						
Pandorina Sp.							r									
Scenedesmus bijugatus (Turpin) Kuetzing		r	r	r			r									
S. quadricauda (Turp.) Brép																
Sphaeroplea africana Fritsch																
Spirogyra varians (Hass) Kütz																
Trichophilus welckeri Weber von Bosse										c						
Ulothrix oscillariana Kütz							r									
U. zonata (Weber et Mohr)	c	r														
Divisions: Euglenophyta:																
Protoeuglena noctilucae													r	r		

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NOTES ON THE GENUS CLERODENDRUM (VERBENACEAE). XXIII

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A virgate, soft-wooded, unarmed, very handsome and ornamental shrub or low treelet, to 3 m. tall, suffrutescent undershrub, or even a perennial herb, basally shrubby and stoloniferous, of rapid growth, gregarious; stems annual, usually very straight or arching, wand-like, mostly unbranched, fluted, hollow; branches, when present, very stout, hollow, obtusely tetragonal, the larger ones 8--10-sulcate, subglabrate; bark smooth, shiny, greenish or ashy-gray; blaze greenish; nodes (except the younger ones) annulate, occasionally marked with a band of pubescence; principal internodes mostly elongate, 2.5--10 cm. long; leaves approximate, opposite, or verticillate in whorls of 3--6, sessile or subsessile, oleander-like; petioles (when present) stout, 3--8 mm. long, glabrous, often striate; leaf-blades membranous or thinly chartaceous, soft when fresh, mostly very fragile when dry, linear-lanceolate or oblong to narrowly elliptic, varying to oblanceolate, 7.5--23 cm. long, 0.7--5.5 cm. wide, apically mostly acute or acuminate, sometimes subobtusely, marginally entire and recurved, basally gradually attenuate to acute, glabrous on both surfaces, sparsely punctate beneath; midrib stout, very prominent beneath; secondaries slender, 7--10 per side, short, arcuate-ascending, prominulous beneath, arcuately joined a few mm. from the margins; vein and veinlet reticulation very sparse, obscure above, not at all prominulous beneath; inflorescence axillary and terminal, abundant, the axillary cymes opposite and solitary or whorled, usually supra-axillary, 4--6 cm. long, 3--7-flowered, lax, widely divaricate; terminal panicle thyrsoid, 45--60 cm. long, 15--25 cm. wide, very showy, usually much elongate and lax, composed of 3--12 whorls of trichotomous cymes, glabrous throughout, often more or less continuous with the many axillary cymes borne in the upper leaf-axils; peduncles and sympodia similar to the stems or branches in size, shape, texture, color, and glabrescence, but slightly more slender; bracts foliaceous, resembling the leaves in all respects but smaller, usually numerous, caducous; bractlets broadly linear, very numerous, reddish when young, 5--15 mm. long, 2--3 mm. wide, glabrous; prophylla linear, 1--6 mm. long; pedicels 0.5--2 cm. long, glabrous; calyx green or finally red, very broadly campanulate, thick-textured, glabrous or subglabrous, its tube 5--7 mm. long, the rim deeply 5-lobed to or below the middle, the lobes subcoriaceous, wide-spreading, ovate, 6--10 mm. long, basally 4--9 mm. wide, apically acute or subacute; corolla hypocrateriform or infundibular, mostly white or whitish to yellowish-white or cream-color, varying to pinkish-white or yellow, very showy, not fragrant, opening at night and closing in the next forenoon, its tube very long and slender, 7.5--15 cm. long, glabrous or patently glandular-hairy, curvate, the limb 1.5--2.5 cm. wide, the lobes oblong or ovate-oblong to obovate, 8--15 mm. long, apically obtuse, eventually strongly reflexed; stamens 4, inserted at the mouth of the corolla-tube, long-exserted, "projecting in a double curve for some time after the flower first expands, afterwards they become revolute" (fide Roxb.);

filaments slender, curvate, red to purple or brown, glabrous; anthers oblong, 2.5--3 mm. long, purple or black, "incumbent, &c. according to the position of the filaments" (*fide* Roxb.), the thecae parallel; pollen ochre-yellow, prolate, $115 \mu \times 84 \mu$, the ectine surface spinulate, the apocolpium diameter 70 μ , the exine thickness 6.2 μ ; style long, slender, purple, "longer than the stamens, at first projecting, or recurved, after impregnation ascending, when the stamens become revolute" (*fide* Roxb.); stigma bilobed, the lobes short, rather thick, apically acute; ovary obtuse, 4-lobed, externally glabrous; fruiting-calyx accrescent, fleshy, bright-red, crimson, or scarlet to brown-red or purple, to 3 cm. in diameter; fruit drupaceous, green and shiny or blue-green when immature, becoming deep-violet, blue-black, or reddish-black to black when ripe, subglobose, 1--1.3 cm. long and wide, normally 4-sulcate and 4-lobed (or 1--3-lobed by abortion), the fleshy exocarp mostly deep-lavender to dark-blue, rugose, fetid; pyrenes 1--4, mostly only 1 or 2 developed, 1-seeded, rounded except for a slight flattening on the inner surface, about 1 cm. long and 8 mm. wide, gibbous and rugose or concave to angular, smooth, the endocarp coriaceous-crustaceous; seeds basally attached, 1 per cell, at first green, later rufescent, the integument simple, membranous, thin, the embryo conforming to the seed in size and shape, erect, white; cotyledons obovate, fleshy, thick, plano-convex; radicle short, conic, inferior; chromosome number: $n = 15$; $2n = 30, 40, 48, \text{ or } 52$.

This species is native from Pakistan, India, and Nepal eastward to Burma, Thailand, Malaya, Indochina, and Indonesia, north to southern China, and is widely cultivated in warm countries of both hemispheres; naturalized in the Hawaiian Islands, New Caledonia, the Samoan and Society Islands, and from the southern United States, through the West Indies, to the Guianas. Nomenclaturally it is based on Amman, *Stirp. Rar. Imp. Ruth. pl. 15* (1739). Savage (1945) has verified that there was no specimen of this species in the Linnean Herbarium (now in London) at Linnaeus' first and second enumerations, but specimens 807/1 and 807/2 were there in his third enumeration. The name, therefore, cannot have been based by Linnaeus on actual specimens but actually on the Amman plate. I examined and photographed both the Linnean specimens and the Amman plate, the photographs being cited below in the present work.

The plant is slightly bitter and astringent, containing an alkaloid. In Asia it is sometimes used as a substitute for opium, often gathered and smoked with tobacco. It yields a resin employed in Burma in the treatment of syphilitic rheumatism. In India the leaves are often eaten raw as a vegetable, being somewhat fleshy when fresh, while the juice from the vegetative parts is used with ghee [a kind of liquid butter made from the milk of cows and buffaloes and clarified by boiling] in the treatment of skin diseases like herpetic eruptions and pemphigus. The resin is used as an insect repellent in preserving clothes. The pounded root is said to be useful (when taken with ginger) in treating asthma, coughs, and other pulmonary complaints, as well as to combat blood diseases, tumors, burning sensations, and scrofulous affections. Smoke produced by burning the dried leaves is also said to cure coughs. In

Java it is the pounded leaves that are dried and smoked in treating asthma. In India the plant is used in the form of a ghee, powders, or enemas in treating abdominal tumors; also in the same country as a tonic and against puerperal fever, atrophy, emaciation, cachexy, gravel, excessive thirst, cholera, blindness, consumption, dry coughs, and bronchitis. In some localities pieces of the wood are made into necklaces and worn around the neck as a charm against various ailments. In New Caledonia the leaves are used both as a general tonic and as a vermifuge.

Boorsma (1902) tells us that "Omtrent deze plant deelt Koorders.. mede, dat de bladeren op Java in gedroogden staat wel als opiums-surrogaat gerookt worden. Door Greshoff werden vroeger...de bladeren reeds met negatief resultaat op eenig werkzaam beginset onderzocht. Het decoct van 1 gram gedroogt blad, bij een Cavia ingespoet, veroorzaakte geenerlei intoxicatie-verschijnselen. Een onbeduidende hoeveelheid alkaloid bleek in de bladeren voorhanden. De alkaloid-opbrengst uit 5 gram bladpoeder, bij een kikker onder de huid geïnjicieerd, bewerkte geen vergoifting. Ook andere toxische bestondeelen werden niet aangetroffen. Daar geen enkel toxisch beginsel voorhanden bleek, is het nauwelijks aan te nemen, dat het rooken van deze bladeren eenig, met de opiumnarkose overeenkomend effect zou teweegbrengen."

According to Burkill (1966) "*Clerodendrons* are, par excellence, plants of Malay magic" and *C. indicum* "is the chief magical species of northern India." According to Sastri (1950) many of the Indian vernacular names applied to this species are also applied to *C. serratum* (L.) Moon "and it is likely that the two species are used indiscriminately in indigenous medicine."

Blatter and his associates (1935) assert categorically that "The [medicinal] properties are the same as those of *C. serratum*" adding that "The root is considered useful is asthma, cough and scrofulous affections. The wood is slightly bitter and astringent." They give its natural distribution as "Deccan and Carnatic, W. coast districts of Madras Presidency, Kumaon, from Sikkim and Assam to Tenasserim. -- Sumatra."

The leaves of *Clerodendrum indicum* are often attacked by the leaf-spotting fungus, *Cercoseptoria clerodendri* Pargi & Singh in northern India and by the larvae of the moth, *Diacrisia obliqua* Walker. The fungus makes circular to subcircular lesions 0.5--4 mm. wide with depressed tan centers and slightly raised reddish-brown margins, resulting in severe leaf-spotting which later spreads to the petioles and tender stems. The infection often leads to dwarfing and defoliation of the host plants.

Stewart (1972) records *C. indicum* as cultivated in gardens on the plains of Pakistan, while Jafri & Khafoor, in a personal communication to me, assert that in that country it is "A favourite ornamental of our gardens. [The] Root is used in chest troubles, and the juice [of the] leaves mixed with butter fat is applied to cure herpetic eruptions etc." They cite unnumbered Saida and Stewart collections.

Sen & Naskar (1965) report it cultivated in India; in Orissa it is said by Panigrahi and his associates (1969) to be "occasional on

moist banks". Srinivasan & Agarwal (1963) list it as cultivated in southeastern India; Patil (1963) found it growing in hedges in the Lucknow area; Vajravelu and his associates (1968) report it "common" in Kerala, citing Vajravelu 19145. In Delhi, according to Maheshwari (1963), it is "Common in the fruit orchards as a shrubby undergrowth", citing Maheshwari 766. In Uttar Pradesh it is said by Panigrahi & Saran (1967) to be "scarce", citing their no. 1559; in Madhya Pradesh it is recorded by Tiwari (1968) and by Subramanyan & Henry (1966), the latter citing their no. 8697. Banerjee (1968) and Gain & Tarafder (1971) found it in Bihar. Haines (1910) describes the plant from along riverbanks and in moist localities in general "probably in all districts" of Chota Nagpur, where it is said to blossom from May to August and to be in fruit from August to November.

Babu (1977) describes *Clerodendrum indicum* as "common in forest clearings and sal forests" at Dehra Dun, where it blooms from April to June and fruits from September to November -- he cites Babu 33357. Bose (1965) reports the species "very common in partial shade and cultivated in gardens" in Bengal, where Prain (1903) asserts that it occurs "in all the provinces". Voigt (1848) lists it as cultivated in the Calcutta suburbs. Dymock (1884) tells us that it is "common in Bombay gardens, and is said to grow wild on the hills east of Ahmednagar". Watt (1889) accredits it to Kumaon, Bengal, and South India, but "it is also common in gardens in Ceylon, where it is not indigenous". Thwaites (1839) and Thwaites & Hooker (1861) also claim it to be common in gardens but not native in Sri Lanka. Willis (1911), however, describes it as both wild and cultivated in Sri Lanka and MacMillan (1943) claims that it is native to both India and Sri Lanka. Freeman & Williams (1928) refer to it as an "East Indian shrub".

Collett & Hemsley (1890) give the species' distribution as "Kumaon eastward to Assam and Tenasserim; also in the mountains of South India and Sumatra". Rao & Rabha (1966) list it from Assam, while Kanjilal and his associates (1939) claim that it is common throughout Assam, where it flowers from October to May and fruits from December to August.

Roxburgh (1832) claims that the species is "Found wild from Orissa northward; where it grows to be a tall, straight shrub. [The] Flowering time [is] the hot season, and again in October; the seed ripens in the cool season." Brandis (1906) reports the plant "Common in many parts of India and Burma. Savannahs in the Duays. Sundrihan. Often as an escape from cultivation." Parker (1924) gives its distribution as "Sub-himalayan tract [in the Punjab] from the Beas eastward. Has been collected in the lower hills of the Hoshiarpur District. Frequently cultivated in gardens", flowering in July and August.

Osmaston (1927) lists the species from the subhimalayan tract of Kumaon to 3000 feet elevation "and [it] has also been recorded by Mr. H. G. Champion from the Ranikhet Division. Apparently not common", flowering there in July and August, and fruiting from September to November. Chopra and his associates (1956) describe it from

the Deccan and Carnatic, the west costal districts of Madras, Kumaon, and from Sikkim and Assam to Tenasserim [Burma]. Yamazaki (1966) gives its distribution as the Himalaya Mountains, India, Burma, Malaya, Indochina, and southern China; Badhwar & Fernandez (1968) give it as "Himalayas from Kumaon to Sikkim and in Assam up to an altitude of 1,200 , (4,000 ft.). Found in many other parts of India." Amaratunga refers to it as "a roadside weed" in Sri Lanka.

Nath (1960) records the species from the Southern Shan States of Burma; Winit found it in cultivation in Thailand; Ridley (1911) lists it from India, Thailand, the Malayan islands, the east coast of Pahang, Singapore, and Perak, while the Baileys (1976) imply that it is only originally native to the Malay Archipelago. Maximowicz (1886) ascribes it to tropical India and Java, citing an unnumbered Vachell collection from southern China. Fernandez-Villar (1980) records it, probably cultivated, from Panay in the Philippine Islands. Vatke (1882) lists it as subsponaneous in garden hedges on Nosy-bé island, off the coast of Madagascar; Bojer (1837) found it in cultivation in Mauritius, flowering there in April and May, giving its original native land as "Inde orientale, Java". In Java Backer & Bakhuizen (1965) describe it as "not rarely cultivated and locally.. naturalized, sometimes copiously in grassy, sunny or slightly shaded localities in settled areas".

In the Samoan Islands *C. indicum* is reported by Christophersen (1935) from along roadsides on Totuila, citing Garber 942. Fosberg and his associates (1979) found it on Guam.

In the New World *Clerodendrum indicum* is widely distributed. Radford and his associates (1964) report it as rare in sandy soil, waste ground, and woodlands in Charleston, Georgetown, and Jasper Counties, South Carolina; in Georgia Duncan found it abundantly established around long-abandoned house-sites on Sapelo Island, while Wood (1877) records that Dr. G. M. Green found it naturalized in fields and on waysides at Macon.

Farther south, Clewell (1985) reports the species both cultivated and escaped in Leon and Wakulla Counties, Florida; Lakela and her associates (1976) found it cultivated, escaped, and established in coastal Florida, where it blooms all through the year; Phillips (1949) also lists it as cultivated in that state. Sargent encountered "dense stands" along damp roadsides in Hardee County; Beal reported it "escaping" on Merritt Island in 1927 and Cuthbert reports it "an abundant escape" at Bradenton "and becoming a weed in cultivated ground, especially in groves". Wunderlin (1982) regards the species as native to the "East Indies" and reports it occasionally escaped from cultivation in disturbed sites in scattered localities in central Florida.

Tracy reports the species "rather common" in Florida and along the Gulf Coast of the U.S.A. to Alabama; Dr. D. Dale Thomas, in a personal communication to me, reports it in low waste ground in East Baton Rouge, Jefferson, Plaquemines, St. James, St. Mary, and Terrebonne Parishes, Louisiana. Ewan says that he found it "persisting after cultivation" in the same state, "locally frequent in old vacant

lots, evidently all escaped and thoroughly naturalized from oldtime plantings". Langlois also speaks of it in Louisiana as "quite a weed around dwellings"; Attabhanyo found it "associated with *Jasminum masonii*" there. Pratt speaks of it there as a "rare large shrub along roadsides in marshy areas" and collected pollen samples preserved as slide 475 in the Palynological Laboratory of Louisiana State University.

The pollen of *Clerodendrum indicum* is described in detail by Nair & Rehman (1962), based on U. P. NBG.16696, slide 2658. Pollen from Irwin 1088 is preserved in the Palynological Collection at the University of Texas.

In the West Indies this species is also widely distributed. Gooding and his associates (1965) found it "occasional on roadsides and in waste places" on Barbados, citing *Herb. Barb. Mus.* 578 and *Herb. Univ. W. Ind.* 261. Duss describes it as very straight in growth and unbranched, spreading by stolons, on Martinique, citing Duss 1220; on the island of Guadeloupe he reports it as inhabiting fields, savannas, and grassy places in general up to 300 m. elevation; Fosberg (1976) reports it on St. Croix and on Dominica it is said to be a "common weed" in banana and coconut groves. The Smiths report that on St. Vincent it is "pretty common locally in thickets and open fields not far from the sea". Broadway encountered it "wild in damp and wet lands" on Tobago and it occurs in meadows on Trinidad.

In South America it grows along canals near the seacoast in Guyana, where Irwin met with it in wet reddish sand on riversides; in French Guiana it has been found "on low swamp lands", while Lasser and his associates (1974) report it in gardens in Venezuela.

Sweet (1826) asserts that, as *C. verticillatum*, it was introduced into English gardens in 1813 from Nepal, while Loudon (1830) claims that, as *C. siphonanthus*, it was introduced as early as 1796 from the "E. Indies".

Recent collectors report finding *C. indicum* growing in moist waste places and waste ground in general, on the banks of irrigation ditches, in deep low woods, in marshes, and on grasslands, on cleared and vacant lots, in dry sandy fields, the edges of fields and forests, the margins of rice paddies, on coastal plains and stream-banks, in roadside thickets, in rocky woods, and in wet hammock soil, from sealevel to 1200 m. altitude, flowering and fruiting in every month of the year. Suwal (1969) asserts "Flowering in June"; Deb (1968) reports that in Tripura (India) it flowers and fruits from December to July; Datta & Majumdar (1966) say that in Bengal it flowers from April to June, while Cooke (1906) found that in Bombay its normal flowering period is September and October. In the Himalayas Badhwar & Fernandez (1968) report it flowering from June to August. Sedgwick tells us that in Bombay it grows in a region of 80 inches annual rainfall, while Bell found it, also in the Bombay area, where the rainfall was 120 inches per year. Bor & Raizada (1954) assert that, in general, in India it flowers in the rainy season and fruits in the cold season. They state that the "shrub... grows 4--8 feet tall in Dehra, with a slender upright form which

makes it attractive when grown against a wall. The long white tubular flowers hanging bell-like from an upright stalk make this a very striking plant during the rains. The flowers are followed by conspicuous dark-blue fruits supported by the persistent spreading red calyx. The plant prefers partial shade and is propagated by seed."

Junell (1934) illustrates a cross-section of the ovary, noting that "Von dem Fruchtblattmitten werden Ausbauchungen gebildet. Die Fruchtblattränder sind verhältnissmäßig dünn und mit leitendem Gewebe versehen. Keine Furchen dringen in die Plazenten ein."

Gaertner (1788) comments that the "Ovulorum numerus quaternarius, uti naturalis, ita quoque constantissimus est. *Valdia* Plumieri, diversissimi generis planta est, si recte se habet genericus character, quem ei tribuit Adansonus." He describes the fruit as: "PER. Bacca succulenta, calycis laciniis acute triangulis cincta, subglobosa, unilocularis, tetrapryrena, per maturitatem exarescens, quadripertibilis. Cuticula matura subspungiosa, rugosa, dorso pyrenarum adnata. Pyrenae regulariter quatuor, sed plerumque duae tantum adolescentes, coriaceo-crustaceae, hinc gibbae, rugosae, inde concavae aut angulatae, uniloculares. REC. nullum; semina basi affixa. SEM. in singulo loculo unicum, eidemque conforme, rufescens. INT. simplex, membranaceum, tenue. ALB. nullum. EMB. femini conformis, erectus, albus. Cotyl. obovatae, carnosae, crassae, plano-convexae. Rad. conica, brevis, infera."

The absence of stone-cells in this plant is noted and discussed by Malaviya (1963). Gibbs (1974) reports leucoanthocyanin and cyanogenesis absent from the leaves and syringin absent from the stems; negative results were obtained with the Ehrlich test. Chopra and his associates (1969) found the bark to contain hexitol (D-mannitol) along with sorbitol. Prakesh & Garg (1969) obtained (24S)-ethyl-cholesta-5, 22,25-triene-3-ol and beta-sitosterol from the stems. Tiwari & Garg (1961) found 7.8 percent hexitols present in the bark -- supposedly the first record of this substance in the *Verbenaceae*.

Sobti & Singh (1961), as well as Cave (1961), give the diploid chromosome count as 48, based on material collected in Jammu; Raman & Kesavan (1963) and Baquar (1967) give it as $2n = 30$; Sharma & Mukhopadhyay (1963) found $2n = 52$ and 46 "some with secondary constrictions"; Cave (1964) gives the number as haploid 15, diploid 52.

The corollas of *Clerodendrum indicum* are described as "white" on Balakrishnan NBK.939, Geesink & al. 6462, Irwin 1088 & R.125, Khalil s.n., Pratt s.n., Qureshi s.n., Setchell 241, Sinclair 5284, and Wilbur & al. 8082, "creamy-white" on Kalloo B.666, "off-white" on Amaratunga 1751, "greenish-white" on Amaratunga 1628 and Collector undetermined s.n., "cream" on Chand 2467, Kingdon-Ward 18856, Koelz 21564, Moldenke & al. 28219, Poore 1366, Rogers 7043-C, and Thorne 1288, "pale-cream" on Herb. Brit. Guian. For. Dept. 7101, and "yellow" on Duncan 20667.

Vernacular and common names reported for the species are numerous: "agniya", "akalbih", "akilbih", "agniya", "angiya", "angiyah", "arnah", "arni", "arní", "balaya", "baloya", "bamanhatti", "bamunhati", "bamun hattae", "bámun-háti", "bamúnhatti", "bamunhatti", "baranai", "barangi", "bead-flower", "beng son", "bhai", "bharangi", "bhárángi", "bhargi", "bhárgi", "bhat", "bidoejoek",

"brahmanpatta", "brahman-patta", "brahmi", "brahmune", "brahmuni", "brahmunuyushtika", "bramanayashtika", "brama yashtika", "brahmunu yashtiki", "cháng guān jiā mò lì", "chingari", "chiruteka", "chokphutra", "clérodendre à fleurs à long tube", "clerodendrum à longues fl[eurs]", "daoen ampioen", "daoen apioen", "daoen opium", "daun apium", "dawa-i-mubarak", "dawai-mubarak", "daw-ai-mubarik", "four-leaved clerodendrum", "gandja", "ganja", "ganja-ganja", "gëndjè", "gendjè", "godong apioen", "gunja-gunja", "hanjika", "hanmathucho", "hemla", "herbe a long cou", "hunjika", "ikhlalir", "India glorybower", "Indian glorybower", "Indische hennep", "jure", "kavalai", "kembang boegang", "lèng son", "long-flowered clerodendrum", "memadatan", "memadatan", "naijemphati", "naijamphati", "narivalai", "nâ yam pà tu", "nhayanpadu", "penatoh", "pénatoh", "pinyin", "ronggo dipo", "sarum cutur", "sarumentur", "sékar petak", "siphonante des Indes", "siphonanthus", "skyrocket", "sky-rocket", "tarlong-pi-thepo", "tow yai-mon", "tubeflower", "tube flower", "tube-flower", "Turk's head", "Turk's-head", "Turk's turban", "Turk's-turban", "Turk's-turben", "Turk's-turbine", "whorl-leaved clerodendrum", and "zonggo-dipo".

In regard to the economic uses of *C. indicum*, Dymock and his associates (1893) report that it is "stated by M. C. Dutt to be in use in Bengal as Bhāraṅgi, but the samples of that drug which we obtained from Calcutta and Cawnpore proved to be the stems and roots of *C. serratum*". Deb (1968) still says that the roots and leaves of *C. indicum* are used in native medicine in Tripura, India. Roxburgh (1832) says that "in some parts of Burma the stems are so long that they are used as rafters in cottages and various other uses". Bal-four (1885) states that the species "Grows in both Peninsulas of India, in Bengal and Sylhet. Its roots and leaves are official; the Persian name [dwai-i-mubarak] means the blessed medicine. It is slightly bitter and astringent; yields resin. Employed in syphilitic rheumatism."

Watt (1889) says that "A confection called Bhārgigūda is prepared [from *C. indicum*] with a decoction of their root and the ten drugs called dasamula, chebulic myrobalan, treacle, and the usual aromatic substances. It is used in asthma. An oil, prepared with a decoction and paste of the root in the usual proportions, is recommended for external application in the marasmus of children."

Burkill (1966) says that it is "A tall-herb, common in India, Indo-China, and southwards into the Malay Peninsula, where it is rare or absent in the south; then it reappears in Java, where it is not uncommon in gardens. It does not seem to have any uses in the [Malay] Peninsula, but in Java it is looked upon as a substitute for Indian hemp, and takes its names. It is smoked; but Boorsma...tried the dried leaves in a tobacco-pipe without finding that they had the slightest effect upon him. Ridley writes as if it may be smoked in the Peninsula, but that it is, is not clearly demonstrated by him."

Vidal tells us that *C. indicum* is used medicinally in Laos. Duke & Ayensu (1985) aver that in China the root is used in the treatment of asthma, cough, and scrofula. In New Caledonia, according to Rageau (1957), this plant "est amer, tonique, peut-être vermifuge. On utilise les feuilles. Dans l'Inde, la plante est réputée répul-

sive pour les insectes et sert à en préserver les vêtements". J. W. Moore reports its use in medicine in the Society Islands, and López-Palacios (1984) reports its use against asthma in Venezuela. Subramanian and his associates (1973) report the presence of a sterol, (24S)-ethylcholesta-5, 22, 25-triene-3-beta-ol, in the leaves, based on their voucher no. 14/72 in the Jipmer herbarium at Pondicherry.

Regarding the cultivation of *Clerodendrum indicum*, Woodrow (1910) tells us to "use a rich garden soil with occasional irrigation". Wurzlow asserts that the plant "will take care of itself provided it is not exposed to too much cold." Firminger (1918) says that in India it "blossoms in May, with a great profusion of white tubular flowers, three or four inches long, when the plant, with its long strap-like leaves, has a very chaste, handsome appearance".

It may be mentioned here that the Duthie s.n. [Mustafabad, 11-6-98] collection, cited below, exhibits very short and extremely narrow leaves, and may well represent the form of the species described by Willdenow as *Siphonanthus angustifolia*. It may be worthy of separate form designation.

It is worth recording that Balakrishnan carefully tells us that the calyx was "green" on his no. 939, but was "pink" on no. 940.

Among numerous errors in the literature of this species may be mentioned the following: In Burman's work (1768) figure "2" on plate 41 is said in the text to represent "*Vites* [sic] *pinnata*" [= *Aglaia odorata* Lour. in the *Meliaceae*], but the figure "2" was placed by the engraver under the righthand portion of the illustration of *Ovieda mitis* [= *Clerodendrum indicum*] while the illustration of *Aglaia odorata* is left unnumbered. Both Burman and Poiret (1819) misrepresent the corolla-limb in their illustration of *Ovieda mitis* as 3-lobed.

Howes (1974) says that the name, "Turk's turban", is applied to "*Clerodendrum* spp.", but, actually, as far as I am aware, it is actually applied only to *C. indicum*. Roxburgh (1832), Watt (1889), Prain (1963), and many other botanists refer to the fruits of this plant as "berries", but, of course, they actually are drupes. Durand & Jackson (1901) mis-cite the Kuntze (1891) reference as page "586" instead of 506 and this mistake has been widely copied by later authors like Alston (1931), Maheshwari (1963), and Varma (1981). The Steudel (1840) reference is often mis-cited as "1841", the titlepage date; similarly, the Hooker & Arnott reference to *C. indicum* is often cited as published in "1841", while actually pages 193--288 were issued in 1836. Willdenow's comments on this plant are often cited as published in "1797", but, actually, part 2 of volume 1, in which they occur, was not published until 1798.

Jackson (1894) credits *Ovieda inermis* to Burman f., Fl. Indica, page 136, plate 43, figure 1, but the plant is named *Ovieda mitis* there; he also mis-cites *O. mitis* L. to page "888" in Linnaeus' Species Plantarum instead of to page 889. The name, *Ovieda mitis* Burm. seems to begin with Scopoli's Introd. Hist. Nat. 171 (1777) rather than in Burm. f., Fl. Indica, pl. 43, fig. 1 & 2 (1768) where the binomial is plainly accredited to Linnaeus.

Persaud and his associates describe *Clerodendrum indicum* as an

"annual, 3--4 ft. tall" -- actually, only the stems are annual, the plant itself is a perennial. Kingdon-Ward speaks of "racemes 20 in. long", but the inflorescences are more accurately described as cymes and cymose panicles, certainly not racemes. *Franc 1284*, in the University of California herbarium, bears a label reading "Plants of Yunnan, China" and giving E. E. Maire as the collector -- obviously a case of labels mixed during the mounting process.

It is worth repeating here Blume's description of what he called *C. fortunatum*. It reads as follows: "*CLERODENDRUM FORTUNATUM*, Linn. *C. foliis verticillatis ternis quaternisve lineari-lanceolatis integerrimis glabris, fasciculis pedunculatis axillaribus (calix campanulato-5-fidus, ad basin purpurascens; flores pallide flavi, tubo longissimo). Crescit: circa Linga Jattio ad rivulos spontaneum; in hortis saepe cultum. Floret: omni tempore. Nomen: Jure.*" The plant here described is obviously not *C. fortunatum*, but *C. indicum* instead. The homonyms of *C. fortunatum* referred to in the synonymy (above) are disposed of now as follows: *C. fortunatum* credited to Blanco is a synonym of *C. minahassae* var. *brevitubulosum* H. J. Lam, while that accredited to Buchanan-Hamilton, to Linnaeus, and to Wallich is the true *C. fortunatum* L.; *C. fortunatum* Burm. is *C. serratum* (L.) Moon and the *C. fortunatum* Sessé & Mocino is *C. ligustrinum* (Jacq.) R. Br. Similarly, the *Clerodendrum angustifolium* Salisb., referred to in the same synonymy (above) is a synonym of *C. fortunatum* L., while *C. angustifolium* (Poir.) Spreng., is a valid species (which see, 57: 482--484). The *Ovieda inermis* credited to "(L. f.) Baill." and to Retzius are *Clerodendrum inerme* (L.) Gaertn.

Alston in Trimen, *Handb. Fl. Ceyl.* 6: 233 (1931) says that a "*Clerodendron mite* Vahl" is NOT a synonym of *C. indicum*. I can find no such binomial accredited to Vahl anywhere else in literature. There is a *Clerodendron mite* accredited to *Vatke* in the *Index Kewensis*, but that IS a synonym of *Clerodendrum indicum*. It is cited to Linnaea 43: 537 (1880-82) from "Afr. trop."

Hartwell (1971) cites "Charaka-Samhita, vol. 1--2. 1888--1909. Calcutta, Corinthian Press, 1718 pp. (transl. by A. C. Kaviratna)" and "Hoernle, A. F. R. 1893--1912. The Bower manuscript. Calcutta, Sup't. Gov't. Printing. 401 pp." As yet I have been unable to verify these references.

It is perhaps also worth noting here that the Willis (1911) work listed in the bibliography of *C. indicum* (above) is credited to both J. C. and M. Willis on the cover of the work, but only to J. C. Willis on the actual titlepage.

Linnaeus (1763) described his *Ovieda mitis* from Java as follows: "*Ovieda foliis lanceolatis subrepandis*". His original description of *Siphonanthus indica* (1753) is "Folia altera, lanceolata; Pedunculi saepe e regione oppositi folii, umbellati. Amm. ruth. 1739, p. 214 t. 15. Bontius, Hist. Nat. Med. Ind. Orient. 159. 1658."

The unnumbered Roxburgh collection, cited below, is probably part of the type collection of *Ovieda verticillata* Roxb. Similarly, the Herb. Otterbein specimen from Essequibo, Guyana, in the Leningrad herbarium, also cited below, is probably a cotype of *Clerodendron longicolle* G. F. W. Mey. -- on its accompanying label it was confused

with *Ovieda ovalifolia* A. L. Juss., a synonym of *Clerodendrum floribundum* R. Br., which see (59: 419--425).

Keys to help distinguish *C. indicum* from other Assam and Indian species of the genus are given under *C. griffithianum* C. B. Clarke in the present series of notes (60: 134--136), from other Indochinese species under *C. hahnianum* Dop (60: 141--143), from Thailand taxa under *C. inerme* (L.) Gaertn., from other Madagascar species under *C. baronianum* Oliv. (58: 184--190), and from other Chinese species under *C. henryi* P'ei (60: 180--182). Other keys that may prove helpful are the following, all somewhat modified by me from the original for the sake of simplicity and nomenclatural accuracy.

Haines (1910) distinguishes the Chota Nagpur species as follows:
1. Leaves under $2\frac{1}{2}$ inches long; corolla white.....*C. phlomidis*.

1a. Leaves over 3 inches long.

2. Leaf-blades ovate; corolla white or white and pink.*C. viscosum*.

2a. Leaf-blades oblong or elliptic, often ternate; corolla blue, the tube $\frac{1}{3}$ to $\frac{1}{2}$ inch long.....*C. serratum*.

2b. Leaf-blades narrow-lanceolate or linear-lanceolate, ternate or quaternate; corolla white, the tube 3--4 inches long.....

C. indicum.

Parker (1924) distinguishes *C. indicum* from other Punjab species as follows:

1. Leaves opposite (or often whorled in *C. serratum*); stems solid.

2. Fruiting-calyx not or only slightly enlarged.

3. Calyx-lobes elongate; leaves less than 3 inches long.....

C. phlomidis.

3a. Calyx-lobes short; leaves to $8\frac{1}{2}$ inches long....*C. serratum*.

2a. Fruiting-calyx much enlarged, red.....*C. viscosum*.

1a. Leaves whorled; stems hollow.....*C. indicum*.

Osmaston (1927) distinguishes the Kumaon species as follows:

1. Leaves opposite (or often whorled in *C. serratum*); stems solid; corolla-tube less than 1 inch long.

2. Leaf-blades narrowly oblong, glabrous at least when mature.....

C. serratum

2a. Leaf-blades broadly ovate, persistently hairy.

3. Flowers in lax panicles 3--8 inches long; corolla single.....

C. viscosum.

3a. Flowers in compact panicles 1-- $1\frac{1}{2}$ inches long; corollas

doubled.....*C. philippinum* f. *multiplax*.

1a. Leaves whorled; stems hollow; corolla 3 or more inches long.....

C. indicum.

[to be continued]

NOTES ON SOME CONIFERS REPORTED FROM SOME INACCESSIBLE
AREAS OF THE SOUTH PACIFIC.

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Amongst some of the poorly explored areas of the South Pacific are three interesting reports given to me by D.J. De Laubenfels of Conifers from little known areas in New Guinea, New Hebrides (Vanuatu) and in Western Samoa. The first report is of a species of Dacrydium collected in Irian Jaya, New Guinea, of which is only represented by an incomplete single herbarium specimen. Another report comes from the island of Espiritu Santo in New Hebrides (Vanuatu) where an unidentified Agathis species occurs and has been seen by a few scientists but has apparently never been collected. The third report concerns sightings of Conifers in the Samoan Islands by aerial view, but any further information on locations or type of Conifer trees thought to be seen has not been obtained. I will further describe these reports to encourage botanical exploration of these areas to find out the true status of these reports.

NEW GUINEA

The first report of a Dacrydium species in New Guinea concerns a species which has been validly published and named, but because it is only represented by a single collection (which is a fragment of a specimen) De Laubenfels has questioned (pers. comm., 3-19-1986) its status. De Laubenfels further questions whether the plant collected is actually a Conifer species. The species was recently reclassified as Dacrydium leptophyllum (Wassch.) De Laub. (Fl. Males. 1986), and is only represented by the type specimen (De Kock 39, LAE) of which I have seen a fragment. Dacrydium leptophyllum was collected from Mount Goliath in eastern Irian Jaya, located at 4°40'S. latitude by 139°50' E. longitude. Mount Goliath is a very inaccessible area and is even hard to locate on most maps. De Laubenfels was able to show me the location of Mount Goliath on a very old map of New Guinea published by the National Geographic Society. The National Geographic map shows Mount Goliath occurring south of the Oranje Ranges in Irian Jaya. On more recent maps Mount Goliath would be located just southeast of the Peg. Jayawijaya ranges in eastern Irian Jaya.

Wasscher (1941) first published the type specimen as Podocarpus leptophylla. De Laubenfels (1969) later listed the specimen from Mount Goliath as a probable synonym of Dacrycarpus imbricatus var. robustus De Laub., but was not certain of that theory. Following De Laubenfels original theory Gaussen (1974) listed the specimen under Dacrycarpus, but made a new combination (Dacrycarpus leptophyllum) which is illegitimate. Interestingly, Gaussen (1974)

gives measurements on the involucreal leaves or foliola of the specimen indicating that perhaps there were once cones on the type specimen. However, De Laubenfels (Fl. Males. 1986) argues that the type specimen is sterile and is not dimorphic but belongs to Dacrydium.

Interestingly De Laubenfels (pers. comm., Nov. 1984) stated that while he was studying at LAE in New Guinea in 1984 he noted a sterile specimen of a Dacrydium species collected by Paijamas from Mount Giluwe (Papua New Guinea) that looked similar to the material from Mount Goliath. However, while De Laubenfels collected from one side of Mount Giluwe in 1984 he was unable to locate the Dacrydium species in question. It seems possible that Dacrydium leptophyllum might occur on other mountain ranges in central New Guinea, that is if it is a valid species. Since Mount Goliath is an inaccessible area, collection of this species may only be possible by means of a helicopter, but by any means it should be encouraged to collect this plant.

NEW HEBRIDES (VANUATU)

The second report concerns the sighting of an unidentified species of Agathis on the southwestern part of the island of Espiritu Santo in the northern New Hebrides. The trees were first mentioned to D.J. De Laubenfels by T.C. Chambers of the University of Melbourne who wrote De Laubenfels in 1974 concerning the Agathis species. In this letter Chambers describes seeing Agathis growing on the knolls or ridges above the Navaka river near the vicinity of Numaus, Espiritu Santo (15°30'S. latitude by 166°49'E. longitude) and that the native people in that region regarded the trees as somewhat sacred. Unfortunately Chambers did not collect any specimens, but noted the Agathis in question looked similar in habit to A. moorei (Lindl.) Mast of New Caledonia. Chambers also mentioned to De Laubenfels that a Japanese expedition had been in the area in 1973 to look for timber prospects. De Laubenfels (pers. comm., 3-19-1986) also told me that some years ago he had talked to a forester in Port Vila who had flown over Numaus in a helicopter. This forester said the Agathis in Numaus looked rather different from typical trees of A. macrophylla (Lindl.) Mast. seen in other areas of New Hebrides. De Laubenfels states that the forester referred to growth form only, that is the Numaus trees were rather short and stocky. Interestingly Chambers states the Numaus trees were rather large. To date the Agathis near Numaus has never been collected and should be encouraged to be collected by some enthusiastic botanist.

WESTERN SAMOA

D.J. De Laubenfels (pers. comm., 3-19-1986) said he had spoken to a botanist in New Caledonia some years ago whom knew someone who had flown over a heavily forested inaccessible crater in W. Samoa by

helicopter. This forester said some of the trees reportedly seen by aerial view resembled the shape or form of a Conifer. However, to date no more information has been obtained and I have not been able to locate the forester who made the original report. Interestingly De Laubenfels (pers. comm., 4-11-86) also states that he has heard reports of Conifers occurring in inaccessible areas in E. Samoa (American Samoa) which have not been confirmed.

It seems possible that an Agathis, Dacrydium or Podocarpus species may very well occur on the higher inaccessible parts of the Samoan Islands. Perhaps the original sighting was on the island of Savaii on Mount Elietoga or Mount Te'elagi which seem rather less known than the island of Upolu. Though it may be possible that one or more species of Conifers occur throughout the higher inaccessible areas of both Western and Eastern Samoa. Botanical exploration of these areas should be encouraged, even if these areas can only be reached by means of a helicopter.

Suggested References

De Laubenfels (1969) J. Arn. Arb. 50: 274-369.

Gausson (1974). Trav. Lab. For. Toul., Tome 2, Gym. Act. et Foss., Chap. 13.

Silba (1986) Encyclopaedia Coniferae. Corvallis.

Wasscher (1941) Blumea 4: 414.

BOOK REVIEWS

Alma L. Moldenke

"THE MACHINERY OF NATURE -- The Living World Around Us And How It Works" by Paul R. Ehrlich, 320 pp. & 40 b/w photo. Simon & Schuster, New York, N. Y. 10020. 1986. \$18.95.

"The very future of our society depends on whether *Homo sapiens* can learn to live without damaging the machinery of nature so seriously that it can no longer support civilization.....: no science, indeed no aspect of human culture, is more important than ecology." This book fulfills its title magnificently, interestingly and logically with cause-effect relationships established on the bases of careful research with which I am familiar. The author's name alone should sell many copies of this book to all kinds of libraries and to individual literate, thinking readers. I feel very strongly that secondary school biology teachers (and indirectly their students) could profit from this reading because of all the intermeshing of ideas and principles. Since few high school biology teachers read PHYTOLOGIA and since I want so much to encourage their reading of this book, I herewith petition all kinds of biologists in the labs, colleges and universities, after they have seen this book, to share it or another copy, please, with these folks who train the general public and those headed for higher education. Ecology students should read this book after their first course or in the summer before it.

"*BEGONIACEAE* Part I: Illustrated Key, Part II: Annotated Species List" by Lyman B. Smith, Dieter C. Wasshausen, Jack Golding & Carrie E. Karegeannes, iii & 584 pp., 1183 b/w herbaria sheet or drawing photos. Smithsonian Institution Press, Washington, D.C. 1986.

This outstanding publication is No. 60 in the series of Smithsonian Contributions to Botany, written by 2 excellent taxonomists who composed the keys and 2 aficionados of cultivated begonias who composed Part II under the tutelage of the first authors and, earlier, Fred A. Barkley. "The last survey of *Begoniaceae* to include all known species was that of A. De Candolle in his Prodrumus in 1864. It has brief descriptions of 380 species....Since 1864 over 1000 species have been proposed." Part I has all known taxa, exclusive of hybrids and cultivars, keyed into 34 subkeys and then to all recognized species with each illustrated by a holotype or type specimen photo. Part II lists alphabetically "all verified species and varietal epithets, including complete synonymy, literature citations and geographical distribution." *Begonia* is virtually the whole family including additionally only 1 species of *Hillebrandia* and only 12 species of *Symbegonia*.

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